

*A webcomic of romance, sarcasm,
math, and language*

xkcd

RANDALL MUNROE

2013

xkcd

2013

a collection of 156 webcomics

from #1155 to #1310

by Randall Munroe

#1155: Kolmogorov Directions

January 02, 2013



WHEN PEOPLE ASK FOR STEP-BY-STEP DIRECTIONS, I WORRY THAT THERE WILL BE TOO MANY STEPS TO REMEMBER, SO I TRY TO PUT THEM IN MINIMAL FORM.

People get really grumpy when they realize you're giving them directions for how to go to the store and buy a GPS.

Explanation

Andrey Kolmogorov was a mathematician who worked, among other things, on defining computational complexity. Roughly speaking, the Kolmogorov complexity of a string (of bits, words, symbols, etc.) is the shortest description that allows an accurate reconstruction — or, in some variants, the length of the smallest program which will output the original string.

Cueball's method of giving directions is very reminiscent of Kolmogorov's method of determining complexity. However, it is unlikely they know all the presidents, nor can calculate prime numbers in their heads, and so will have trouble with certain parts. These directions may have minimal Kolmogorov complexity, but they are non-intuitive and are likely not the shortest or quickest way to get there, considering that they consist mostly of left turns.

For most routes the shortest algorithm will very likely be based on some Maze-solving algorithm which is guaranteed to eventually visit every place and follow it until you reach your destination. This might take a very long time (for example it is possible that the algorithm will have you travel through all South-America first for a trip between two US cities).

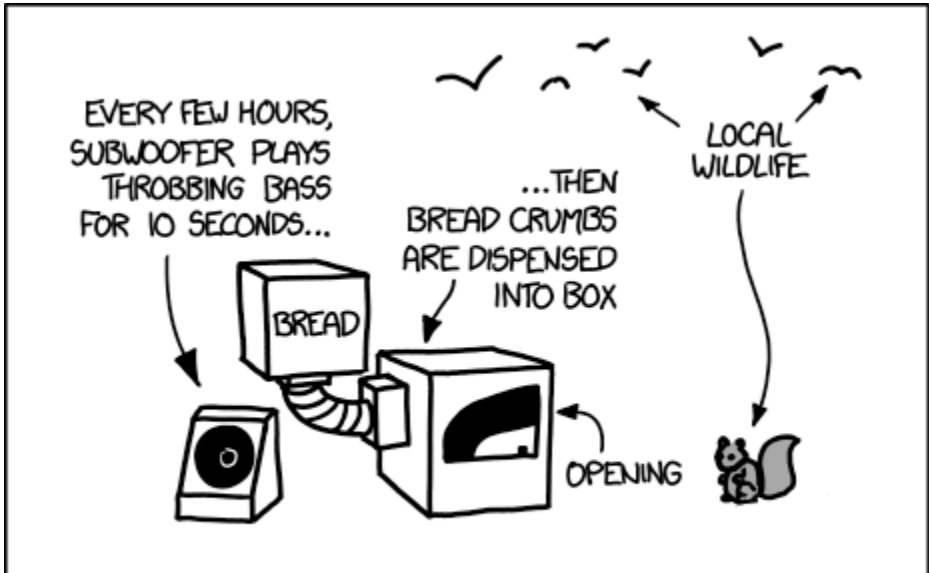
This is not the first time Cueball has had difficulties with directions, and here we see he hates giving directions as much as he hates receiving them.

The joke in the title text is that Cueball just sent his friend to a store to buy a GPS device to give him the correct directions. (By the time this comic was published, GPS-enabled smartphones had already largely displaced dedicated GPS devices, but Cueball could be talking to a person who does not wish to own a smartphone.)

The superfluousness of giving directions as opposed to using a GPS is the subject of 783: I Don't Want Directions.

#1156: Conditioning

January 04, 2013



PROTIP: LEAVE THIS DEVICE IN YOUR YARD FOR A WEEK, THEN WATCH AS THE PROBLEM OF LOUD MUSIC FROM PASSING CARS SOLVES ITSELF.

'Why are you standing in the yard wearing a papal hat and a robe covered in seeds?' 'Well, the Pope is visiting our town next month ...'

Explanation

Herein, the author devises a method of addressing the issue of drivers who turn up their music to irritating levels which usually results in a lot of bass coming from the car — the low frequencies being the ones that most easily penetrate the car and travel farther, thus being more audible to those around the car.

As the title suggests, the idea is to condition animals to respond to a thumping bass. The machine is described as working as follows: every few hours, the bass would turn on, and the box would dispense food behind an opening designed to look like an open car window. Over time, local wildlife would flock to the box to get the food from inside, and would become trained that the sound of a subwoofer means that they can get food by flying through a car window.. Eventually, the animals would respond to any low music, including that played by cars.

The end result would be that the local wildlife would approach, and presumably attempt to enter, any car that has that same thumping bass. Drivers, in turn, would cease to turn up their music in order to prevent the groups of animals from chasing after their cars, thus solving the problem of annoyingly loud bass. This behavior modification can itself be seen as a somewhat different form of conditioning.

The title text is a dialogue about using a similar method of conditioning to send animals after a visiting Pope.

Why someone would want that to happen is left to the reader's imagination, although papal visitations usually disrupt the local communities with onerous traffic and special and ostentatious ceremonies, and do attract huge crowds of dignitaries, celebrities, the faithful, the curious, and attending purveyors of foodstuffs and trinkets. Not to mention the impact to the local AirBnB market. Or it could just be Black Hat, who would not need any particular reason for this sort of behavior, and might choose the Pope because of his highly recognizable outfit.

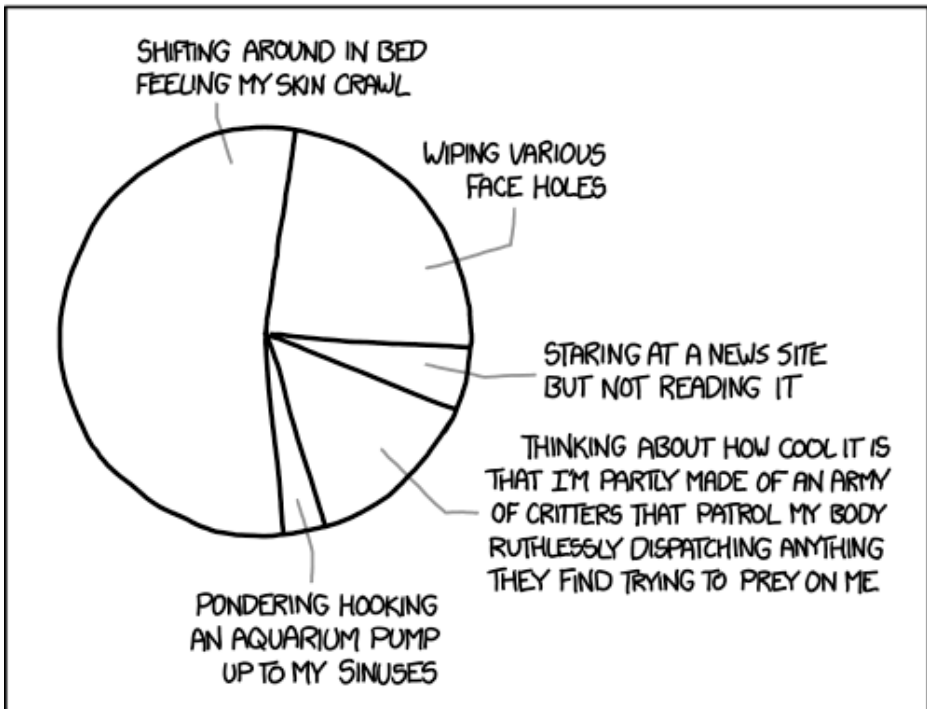
Although these plans may seem far-fetched, a similar scheme was seriously proposed in the United Kingdom during World War I to condition seagulls to associate a submarine's periscope with food, which would give away the locations of enemy submarines as the gulls flocked to their periscopes being raised.

There is also a story about a university student using such conditioning to get birds to disrupt a football game using a strategy similar to the one for the pope in the title text. The student went to the football field every day during summer break dressed as a referee, spreading seeds and blowing his whistle. During the first game at the next semester, the first whistle of the referee summoned a large number of birds looking for the usual seeds, preventing the game from proceeding. According to Snopes, there is no evidence of this ever actually taking place, but it's nearly impossible to disprove.

#1157: Sick Day

January 07, 2013

ACTIVITIES WHILE SICK:



Wikipedia path: Virus -> Immune system -> Innate immune system -> Parasites -> List of parasites of humans -> Naegleria fowleri -> Primary amoebic meningoencephalitis -> Deciding I DEFINITELY shouldn't connect an aquarium pump to my sinuses

Explanation

This pie chart for the most part reflects the usual experience of being sick — tossing and turning in bed and cleaning up mucus and other bodily fluids from facial orifices— in addition to a few ponderings of a rather more scientific bent.

The "army of critters that patrol my body" would appear to refer to the human immune system, which is made up of various cells and processes that actively fight infections and pathogens.

The punchline appears to be "pondering hooking an aquarium pump to my sinuses," which indicates that Randall's sinuses were completely clogged with mucus, which made him wonder whether hooking up an aquarium pump would help clear them out, perhaps akin to a Neti pot. Studies on nasal irrigation, however, have had mixed results, and the practice may not in fact be beneficial.

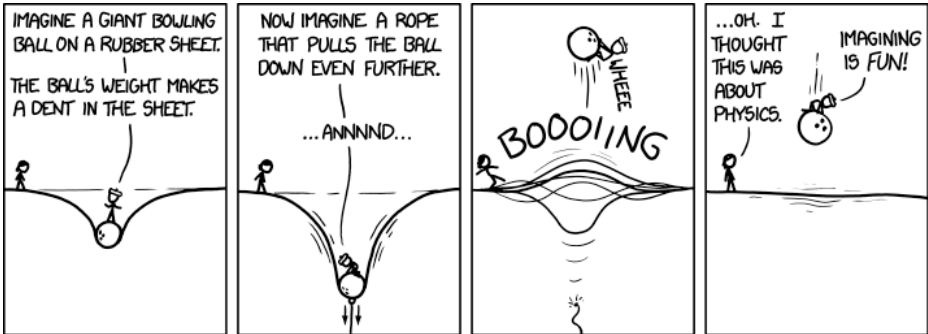
Randall's Wikipedia path: Virus → Immune system → Innate immune system → Parasites → List of parasites of humans → *Naegleria fowleri* → Primary amoebic meningoencephalitis.

Naegleria fowleri is known as the brain-eating amoeba. It is found in warm bodies of stagnant fresh water and causes the disease primary amoebic meningoencephalitis, a rare but highly lethal condition. Although *N. fowleri*

are not commonly found in aquaria, Randall's Wikipedia wanderings force him to conclude that attempting to clear out his sinuses with an aquarium pump is too risky. Since this danger would presumably not be present at all with an unused, sterilized aquarium pump, the comic may be referring to a particular pump currently in use and close at hand.

#1158: Rubber Sheet

January 09, 2013



It IS about physics. It ALL is.

Explanation

This comic refers to a common analogy used to explain how mass distorts space-time — a bowling ball resting on a sheet of rubber distorts the sheet due to its weight. The system has some qualitative features in common with gravity; it's often misused to show that "mass warps spacetime" (895: Teaching Physics).

The next part of the original analogy explains a black hole: the slope of the sheet becomes so deep that you can't climb out from the bottom any more, similar to a black hole, which even light can't escape from. However, the comic subverts the analogy, and the sheet becomes a trampoline instead.

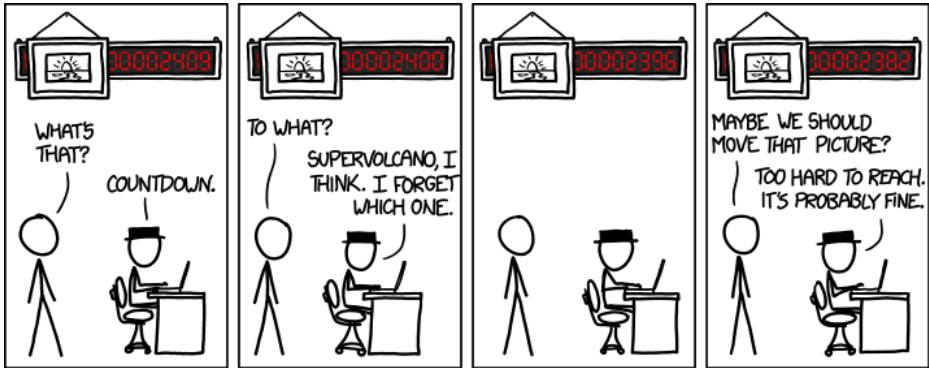
Reading onwards, it seems that Beret Guy is just messing about with the scenario.

The line "Imagining is fun!" is also a homage to Richard P. Feynman's "Fun to Imagine" Series of Interviews. The power of Beret Guy's imagination—so that he can physically experience what he imagines—is reminiscent of 248: Hypotheticals.

The title text also states that the rubber sheet, broken rope and trampoline are still all about physics (see also 435: Purity).

#1159: Countdown

January 11, 2013



For all we know, the odds are in our favor.

Explanation

The comic shows a seven segment display (aka calculator-style numbers) with a countdown. Black Hat explains that it is a countdown, maybe to a supervolcano eruption. However, an unfortunately placed picture blocks view of the full display. Due to the form of a seven-segment display, the first digit could be 0, 6, or 8, and five digits are completely blocked by the picture. Cueball is worried and asks him to move the picture, but Black Hat lazily or teasingly refuses to move it.

He has already teased that he doesn't know what the countdown is for. His reply can either be understood as if he does not know which one of the (seven potential) supervolcanos it is counting down to, or to which other cataclysmic event it is a countdown for (such as a meteor strike or global nuclear war for instance - it could also just be a general Doomsday Clock). Since it seems to be Black Hat's countdown, it is safe to assume that he knows both what it counts down to and when it stops, but he just likes to mess with peoples' minds.

The fully visible part starts at 2409, and based on the pace of the scene, it seems to be in seconds. Thus, it is unclear when the eruption might occur. If the obscured digits are '899 999', there's another 2.85 million years to go. On the other hand, if they are all 0s, it could be as soon as 45 minutes.

The choice of the picture is probably also interesting.

The image is distorted enough that you can imagine it as being two very different images.

In either case, it could make sense. If it is a volcano, the supervolcano clock makes sense. On the other hand, we are talking about the possible end of the world as we know it, so the sun setting upon humanity could be a great metaphor.

The title text: "For all we know, the odds are in our favor" could imply the assumption that since we can't see the digits behind the picture, we can treat them as random. If so, chances are only 1 in 300 000 they are all zeros. However, because of statistical principles such as Benford's law, the digits are not entirely random.

In an alternative view, the strip is not about pondering at distributions of digits on an oracle countdown. It's more of a grim view of our natural disaster prediction capabilities. As they say – the question is not if it will happen but when it will happen. "Move the picture" would mean investing in research and warning systems - that would correspond to shifting the picture to the left. If we disregard the 40 minutes, but instead think of it as an arbitrary interval of interests, minuscule as we folks have them, say - one's lifetime; or grimmer yet - some term of office. Because, hey, year after year passes and no apocalypse has been observed - the empirical odds are low indeed. An interesting question is what we would use the knowledge of the timing of our impending doom, if it is an event we can do nothing about, such as stopping a supervolcanic eruption or a large asteroid with a direct

impact course on Earth. Would we not have lives more happily for our remaining years, how few that might be, while not knowing... On the other hand, if the event is something we might prevent given enough time to plan (and the funding resources such knowledge would ensure), then it may have saved us if we moved the picture just in time!

Using a countdown theme for comic #1159 could be a subtle joke, as 11:59/23:59 is one minute to midnight (on the Doomsday Clock!).

Supervolcanos were also referenced in the title text of 1053: Ten Thousand and it is the subject of in 1611: Baking Soda and Vinegar.

#1160: Drop Those Pounds

January 14, 2013



THE FLYER FOR OUR
TREBUCHET-BUILDING CLUB
MAY HAVE BEEN TOO SUBTLE.

If the flyers don't work, we'll switch to the **LEAST** subtle method of informing a town of the existence of a trebuchet club.

Explanation

The comic presents a flyer with text typical of a ubiquitous advertisement for a "Weight Loss Program". However, the image at the bottom of the flyer and the text below the flyer make it clear that the flyer is actually an advertisement for a trebuchet club. This unexpected meaning is meant to highlight the ambiguity of the flyer's content. A counterweight trebuchet is typically a gravity powered siege engine, which was originally used to attack fortifications. It works by dropping a raised counter weight to rotate a throwing arm, launching a projectile on a ballistic path. The phrase "We'll help you hit your target by dropping 30 pounds FAST" is where the ambiguity is produced. In the context of a weight loss ad, the "target" would be a rhetorical device referring to the weight which one wishes to achieve. In the context of a trebuchet club, the target is a literal location which one is trying to hit with a projectile. Likewise, a weight loss ad may indicate that a client could quickly lose 30 pounds (~13.6 kg). However, in this context, the 30 pounds being dropped is either the counter-weight - which is dropped to provide a trebuchet with its power, implying a rather small trebuchet - or the projectile itself being dropped at the target - it will be slower than the counter-weight but definitely still much faster than any weight loss program.[citation needed]

The only hint that the flyer advertises a trebuchet club is in the drawing at the bottom of the flyer, which appears to show two individuals pondering a ballistic path

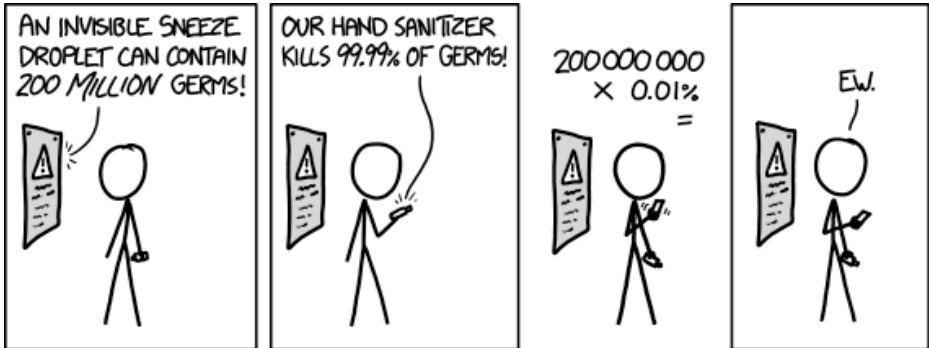
towards a castle tower, though no trebuchet is shown; ironically, such a flyer would have a reasonable chance of being quite effective by virtue of the uniqueness (and relative outlandishness of a trebuchet club) of pulling the rug on what appears to be a weight loss advertisement, likely sticking in the minds of more than a few people who do realize that it is about trebuchets from the pictogram or the website in the small print.

The text below indicates that this flyer "may have been too subtle". The title text suggests that, if the flyer is indeed too subtle a form of advertisement, they will use the LEAST subtle options of announcing their club's existence — likely by using their trebuchet to attack the town. That would certainly get the club some attention!

See also 382: Trebuchet.

#1161: Hand Sanitizer

January 16, 2013



Hipster CDC Reports Flu Epidemic Peaked Years Ago

Explanation

In this comic, Cueball is looking at a poster telling him about the number of germs in a sneeze droplet. He then looks at the label on his hand sanitizer, and goes "Ew.", thinking about how many germs he would still have on his hands even after applying hand sanitizer to his hands.

The number of germs that would be left after using the hand sanitizer is 200 million times 0.01%. 0.01% is equivalent to 0.0001 in decimal, so the multiplication is $200\,000\,000 \times 0.0001$. That is 20 thousand germs, which is still a surprisingly large number of germs. Recently, scientists have shown that it only takes 20 virus particles to infect someone (with analyzed virus; not all germs are equally effective). However, they have also previously noted that the effectiveness of hand sanitizer is actually higher than 99.99%, but it's a bit awkward to print a more precise decimal in an advertising slogan. (Several brands actually kill near 100%, but don't want to risk going to court for false advertising because a few germs got past.)

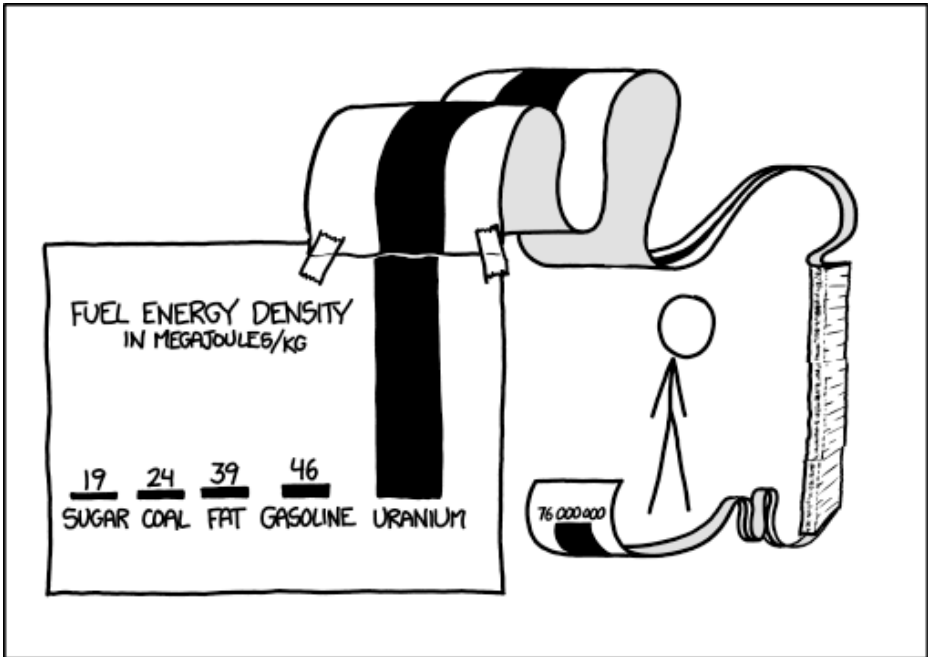
"Hipster CDC" is a combination of the acronym for the Centers for Disease Control and Prevention, an organization dedicated to studying infectious diseases and limiting their spread, with the label hipster. Hipsters form a cultural group associated with a distaste for popular culture; they stereotypically talk about how bands, authors, etc. were better before they "went mainstream" and proclaim that they liked a certain thing

"before it was cool."

The title text extends this sensibility to the flu, which in fact did peak years ago, such as in 1918, when a world-wide flu epidemic killed tens of millions. The humor lies in the notion that the "Hipster CDC" apparently approves of the time when the flu was more widespread and fatal, while most people consider the diminishment of the flu is a good thing. This could be a jab at hipsters' common insistence on liking things before they "go mainstream": many things, before they go mainstream, just aren't very good, and therefore hipsters' taste in things is highly questionable.

#1162: Log Scale

January 18, 2013



SCIENCE TIP: LOG SCALES ARE FOR QUITTERS WHO CAN'T FIND ENOUGH PAPER TO MAKE THEIR POINT PROPERLY.

Knuth Paper-Stack Notation: Write down the number on pages. Stack them. If the stack is too tall to fit in the room, write down the number of pages it would take to write down the number. **THAT** number won't fit in the room? Repeat. When a stack fits, write the number of iterations on a card. Pin it to the stack.

Explanation

This comic strip is a tip, specifically the first science tip. As with most of Randall's tips, it is technically interesting for some applications but not very practical.

Uranium is stated to have 76 million MJ/kg, while the next highest material shown on the graph (gasoline) has 46 MJ/kg. Thus the uranium graph should be taller by a factor of $76,000,000/46 = 1.652$ million. So, if the gasoline graph were 9mm in height, the uranium graph should be a bit more than 14.868 million mm tall, or nearly 15 km (9.2 miles) tall. Thus the need to fold the paper.

It should be noted that the method of extracting energy from the first 4 materials (combustion) is completely different from the method used with uranium (nuclear fission). If the technology existed to use nuclear fusion at the time of the comic, then the first 4 materials would yield a higher energy density than uranium.

A log scale is a way of showing largely unequal data sizes in a comprehensible way, using an exponential function between each notch on the y axis of a graph. So for example the first on a Y axis of a graph using a log-10-scale would be 1, then 10, then 100 and 1000 for the fourth. A log/logarithmic function is the inverse of a corresponding exponential function. A log-scale version of the chart in the comic would look like this:

The log scale can also be abused to make data look more uniform than it really is. On a log scale the energy density of uranium looks larger than that of the other materials, but not dramatically so. The joke is that if one wanted to make their point "properly," they would go ahead and use ridiculous amounts of paper to show the difference between bars using a linear scale; this method would focus more on the shock factor of the differences in question, and less on actual communication/representation of data. Cueball seems to be passionate about the MJ/kg of uranium, so he would rather demonstrate the grandeur of the data than use a more efficient scale.

See these examples for well known day-to-day measurements which are measured on a log-scale.

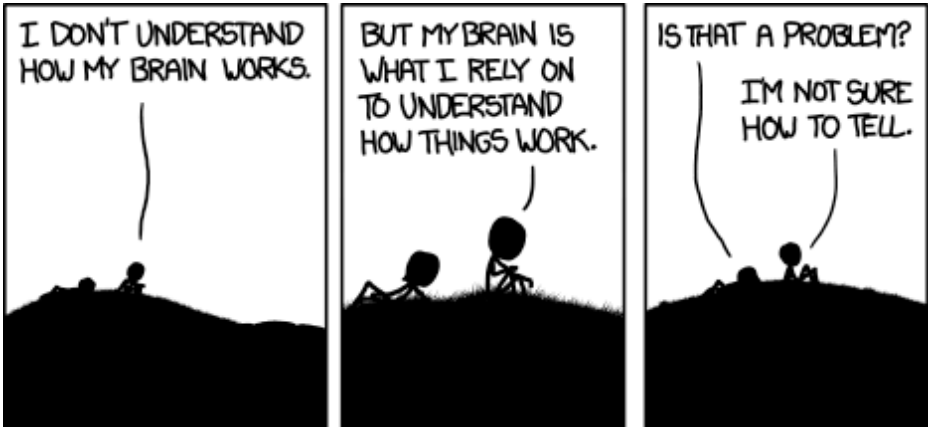
The title text mentions computer scientist Donald Knuth; the fictional notation is a parody of Knuth's up-arrow notation. Using paper thickness as the basis for a log scale would probably give the exponential function a very large base. However, it can be noted that Knuth's up-arrow notation can handle numbers far, far larger than this paper stack notation; for example the number $3 \uparrow \uparrow \uparrow 3$, also known as Tritri, very compact in up-arrow notation, would require a number of iterations pinned to the stack on the order of several trillion. $3 \uparrow \uparrow \uparrow \uparrow 3$, also known as Grahal, would require a number of iterations that is not only too large to write down, but attempting to write that number using the same paper stack notation would require printing off a second stack of several trillion iterations just to hold the number pinned to the

first stack. By repeating this multi-stack repetition, you reach the limit of up-arrow notation.

It should be noted that Randall has used log scales in past comics.

#1163: Debugger

January 21, 2013



It can take a site a while to figure out that there's a problem with their 'report a bug' form.

Explanation

Cueball mentions to Megan that he can't understand how his mind works, the same mind he uses to understand how things work, and he's not sure if this is a problem. In other words, if he can't understand how his mind works, then how can he tell that it does in fact work and that his perception of reality is accurate? Ordinarily he would use his mind to figure it out, but if his mind really doesn't work, then he'll probably never determine that his mind doesn't work. Not only that, he can't even trust his brain to tell him if his inability to understand his own brain is an issue. Understandably, he's a little unsure of how he should feel about this.

Per the comic title, a debugger is a piece of software used by programmers to find bugs in the applications they are making. The title is an allusion to that debuggers are very much like our brains in the aspect described above - most programmers don't understand how debuggers internally work, and they can't be sure that debugger is bug-free - if there is a bug in the debugger itself, it can't be accurately used to find bugs.

The title text alludes to the above problem, in that if a website's "report a bug" page is buggy to a degree that it prevents the actual reporting of a bug, then users cannot use the form to report that the form itself is broken. Thus it can take quite some time before the site administrators realize this error, if they do at all, as unless they test it themselves, the administrators are likely

relying on users to report problems they find, which they can't, making it appear as if there are no problems. This is somewhat analogous to the "brain" dilemma in the main comic, where the usual problem-pondering and resolving method itself can have a problem, but there is no straightforward way to tell. Even if Megan tells Cueball that a problem exists: if Cueball's "report a bug" system is broken, he might simply disregard this information.

#1164: Home Alone

January 23, 2013



REJECTED MOVIE IDEAS:
AGE-REVERSED HOME ALONE REBOOT.

Starring Macaulay Culkin.

Explanation

Home Alone is a popular 1990 film in which the child protagonist Kevin McCallister (portrayed by Macaulay Culkin) is accidentally left alone in his house when his family goes on vacation, and has to thwart a burglary all by himself. In the movie, McCallister comes up with a variety of ingenious traps and schemes (usually involving jury-rigged toys and household items) to harass, injure and eventually incapacitate the burglars, which was the film's defining feature. On a more general level, the films revolve around the classical trope with an underdog defeating a much stronger opponent (the burglars), through his own ingenuity. The film spawned a series of sequels (5 as of 2024, the first of which also starred Culkin) all with a similar premise to the original.

This strip, however, proposes a reboot of the franchise, with the main change to the film being that of an age-reversal, so the story is now about an adult man setting needlessly harmful traps to hurt defenseless children breaking into his house. This would likely be seen as distasteful at the very least, and would probably lead to a negative reputation for the film. The title text adds another punchline when it is revealed that the reboot also stars Macaulay Culkin in the same role. This may suggest that the age-reversal gimmick was done to allow for him to star in the film as the same character despite growing up since the beginning of the franchise. This would be a rather misguided attempt to revive his career, and would probably just prevent any further

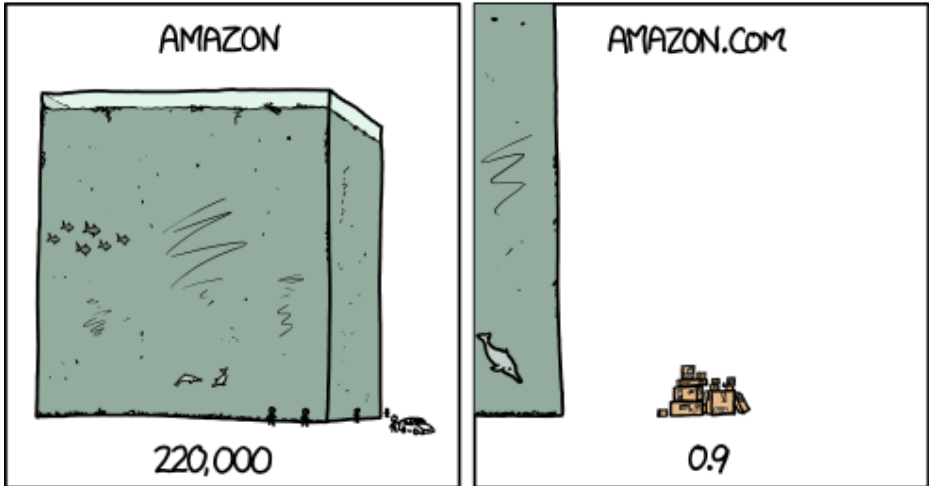
success.

The scene depicted in the strip is an adaptation of an iconic scene from the first movie (used heavily in advertising) where McCallister hangs two paint cans in strings above the staircase, and let them swing down to hit the burglars in the face.

#1165: Amazon

January 25, 2013

ROUND 14: ESTIMATED OUTFLOW VOLUME IN CUBIC METERS PER SECOND



ADVANTAGE: AMAZON

Amazon.com took a surprise early lead with 'Time required to transport a package from Iquitos, Peru to Manaus, Brazil' but then lost it at 'Minutes to skeletonize a cow'.

Explanation

The Amazon River in South America is the second longest river in the world and by far the largest by waterflow. Amazon.com is a website that specializes in commerce and selling goods over the internet. The "round 14" suggest they are being compared in different criteria in a sort of competition. With such different systems, we can assume that most of those comparisons were similarly funny. The title text mentions two other criteria of comparison.

The measure of flow for the Amazon river (cubic meters per second) indicates the volume of water that passes a given area in the river at any second. To illustrate how much 220,000 cubic meters is, the comic shows a car parked next to 220,000 cubic meters of water. 220,000 cubic meters equals a cube with an edge span of 60.4 meters. By comparison the 0.9 cubic meters (900 L) of goods that are shipped by Amazon.com seems very small (note that 900 liters of goods per second is still a lot). To illustrate this size, the comic shows an Amazonian fish (or possibly an Amazon river dolphin) investigating the packages.

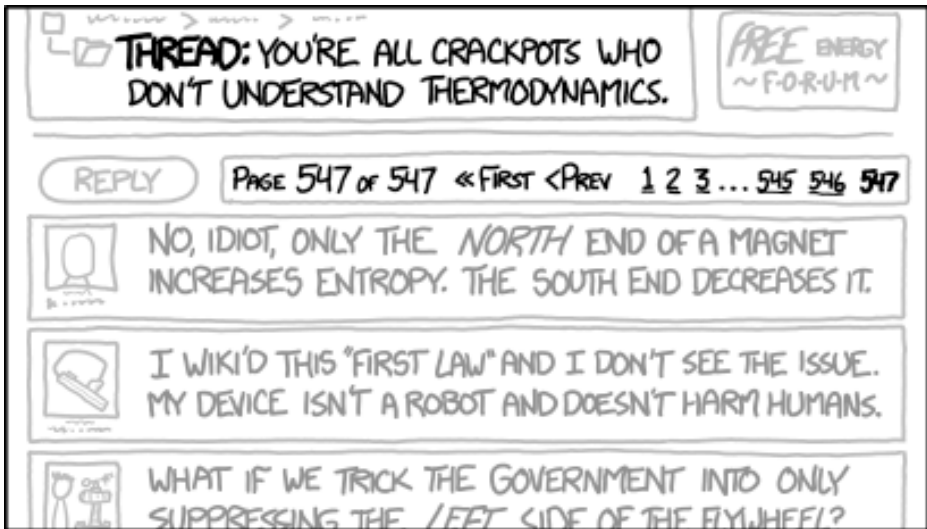
Iquitos and Manaus are cities near the source and middle respectively of the river; the title text suggests that it is shorter to have a package shipped between the two than let it drift downstream. "Minutes to skeletonize a cow" refers to piranha, an Amazonian predatory fish with a popular reputation of being capable of the mentioned

act when hunting in groups. (It should be noted that, while not fictional per se, the legendary cow-killing piranhas had been starved beforehand by local humans.)

In 1599: Water Delivery Amazon.com delivers water, as a direct reflection of what the Amazon river actually achieves by default.

#1166: Argument

January 28, 2013



IRONICALLY, THE ARGUMENT I STARTED ON A PERPETUAL MOTION FORUM IN 2004 SHOWS NO SIGNS OF SLOWING DOWN.

The misguided search for a perpetual motion machine has run substantially longer than any attempted perpetual motion machine.

Explanation

A perpetual motion machine is a hypothetical device that is supposed to move infinitely with no external forces helping it, thus providing an unlimited source of energy. The existence of such an object would contradict the laws of thermodynamics, so perpetual motion machines are known to be impossible.

A conspiracy theory called free energy suppression asserts that it really is possible to get infinite energy and special interest groups have worked to hide it. In the comic, Randall says that he posted to a forum dedicated to the idea back in 2004, and the thread is still active — it kept on going forever, like the perpetual motion machine they desire (in contrast with real attempts to build such a machine, which all stop quite soon). Of course, the reason the thread continues is that its advocates continue to add energy to it, in the form of comments. "Hot air", if you will.

The second law of thermodynamics states that the entropy of an isolated system never decreases. See this video about entropy. Thus, even if you could build a perpetual motion machine, you wouldn't be able to use it to produce energy that could be consumed by another device.

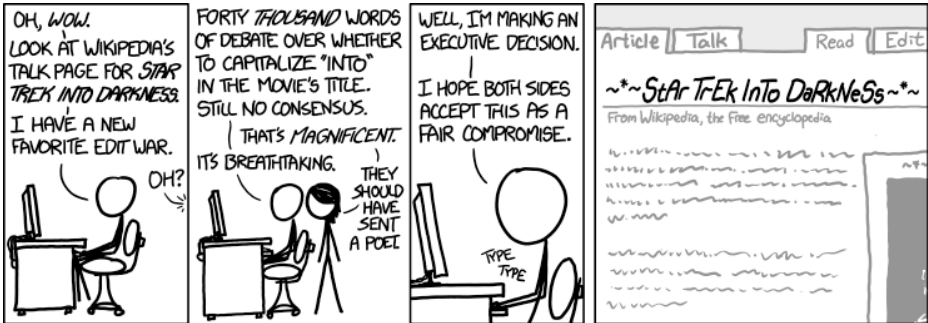
The three supposed comments show humorous forms of scientific ignorance:

Furthermore, the avatar being used by the second poster is that of a power strip plugged into itself, which is often jokingly thought of as a perpetual motion machine.

The title text refers to the fact that inventors have been trying to create perpetual motion machines, but have all failed to succeed. But given the fact that they all failed, each attempted perpetual motion machine stopped running at some point, while the search has never stopped.

#1167: Star Trek into Darkness

January 30, 2013



Of course, factions immediately sprang up in favor of '*sTaR tReK iNtO dArKnEsS*', 'xX_StAr TrEk InTo DaRkNess_Xx', and 'Star Trek Into Darkness' (that's a lowercase 'L').

Explanation

The talk page of a Wikipedia article is used to discuss changes to the article. An edit war is a dispute about a specific edit to an article, manifesting as a series of edits alternating between making and reverting the change, and usually accompanied by a more-or-less heated debate on the talk page.

Here, Randall is referring to a dispute on the Wikipedia article about Star Trek I(i)nto Darkness (an upcoming Star Trek film at the time of the comic's posting). On the day before the comic was published, the article name had a lowercase "into", and the talk page looked like this (rounded off in a friendly way, with the posting of a summary of the arguments, and an exchange of virtual hugs). In summary, the debate centers around whether "I(i)nto Darkness" should be treated as a prepositional phrase (as in "Star Trek[king] I(i)nto Darkness") or an unpunctuated subtitle (as in "Star Trek[:] Into Darkness"), whether compound prepositions like "into" should be capitalized in titles, and whether the capitalization of the title in the movie's official promotional material is relevant. The intensity and multiple facets of a debate over one tiny letter is apparently entertaining to Randall.

Cueball changes the title to "~*~ StAr TrEk InTo DaRkNeSs ~*~" so that every other letter is capitalized, and the title as a whole is framed by tildes and asterisks (a common, but childish and ugly[citation needed] way of

emphasizing titles online). This is a particularly silly compromise wherein the title is so obviously wrong, both sides will actually agree on something (either agree that Randall's title is wrong or that Randall's title is an acceptable middle ground).

The title text indicates Randall's belief that such arguments are perpetual and will always arise. He suggests that the edit to the Wikipedia page will result in a dispute over variants of Cueballs "compromise". One new alternative has the letter cases switched (or shifted, depending on your perspective), one uses a different set of "bracketing" characters (xX_[...]_Xx instead of ~*~[...]~*~), and one uses the original title, but with a lowercase "L" instead of a capital "I" (which appear similar in many fonts).

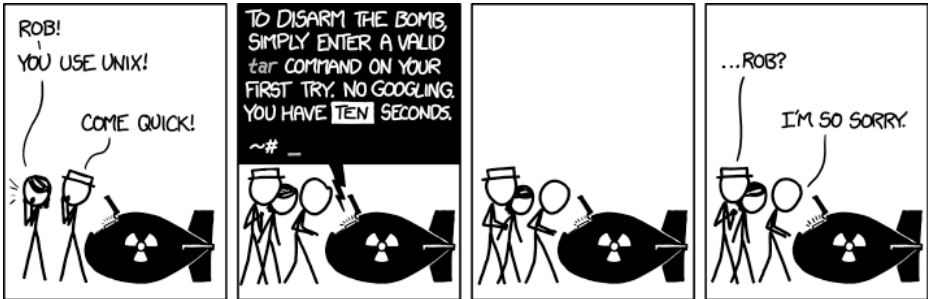
Alternating-case text later caught on as an internet meme in 2017 (four years after this comic strip was published) for representing a mocking tone.

Megan's line of "They should have sent a poet." is a quote from the film *Contact*. The quote is also referenced in 482: Height. In the movie, the line was meant to convey that only a poet could adequately capture the beauty seen; here, it indicates that prose is insufficient to capture the ironic beauty of the edit war.

The old "favorite edit war" might be the one referenced in the title text of 878: Model Rail or the one resulting from the addition of the 739: Malamanteau article to Wikipedia

#1168: tar

February 01, 2013



I don't know what's worse--the fact that after 15 years of using tar I still can't keep the flags straight, or that after 15 years of technological advancement I'm still mucking with tar flags that were 15 years old when I started.

Explanation

tar ("tape archive") is a Unix application that creates (and extracts) archives in the ".tar" format. It is typically used through the text-based terminal, using cryptic single-letter arguments such as "tar -cvf archive.tar *". Many Unix executables are distributed via tar archives; as a result tar files would be encountered by Unix users as commonly as Windows users encounter EXE files. Depending on the flavor of Unix, the order of the flags, or the exclusion of the hyphen, could render the command incorrect, which would either throw up an error or worse, cause one to accidentally overwrite or delete important files.

The comic alludes to the fact that, despite years of use of the command, it is incredibly hard to remember what the letters stand for without looking them up, such as with Google. The joke here is that a "tar" command with perfect syntax on the first try without outside help is such a daunting task that even Rob can't overcome it with confidence, and apologizes for not being able to prevent their imminent death.

The title text points out that while much of computing changes very quickly, the tar program, which is very old (originating ca. 1975), is still around and heavily used. Randall points out the paradox that after 15 years he is still unable to write out a proper tar command from memory, yet at the same time he feels that he shouldn't have to and a newer, better tool really should have come

along already.

There is probably also a pun on "tarbomb," a poorly created tar archive that, when extracted, dumps a load of files into the current directory that the user has to clean up. And although the bomb looks more like Fat Man, the type of bomb that was used over Nagasaki, at least size-wise, it may also be a pun on the name of the largest ever hydrogen bomb which was called the Tsar Bomba (translation: "emperor bomb").

In 208: Regular Expressions Cueball saves the day by knowing regular expressions, although in the title text it is alluded to how easy these may also miss a character.

Rob may refer to Rob Pike, who was a member of the team at AT&T who created Unix.

#1169: Expedition

February 04, 2013

FEBRUARY 4TH:
DEPARTED THE MOUTH OF THE
LENA RIVER, HEADING SOUTH.

IT HAS BEEN NEARLY HALF
AN HOUR AND STILL NO
SIGN OF CIVILIZATION.

THE SCROLL WHEEL TEMPTS
ME, BUT I WILL NOT CHEAT.



MY HOBBY: GETTING LOST ON
GOOGLE MAPS SATELLITE

I'm pretty sure I've logged more hours in Google Maps over the past decade than in any game.

Explanation

Google Maps is a service provided by Google that offers a map of the world including satellite and aerial imagery for free. Using the scroll wheel, the user can zoom out to see a larger area. The Lena River is a river in northern Russia, flowing into the Arctic Ocean (with a large delta).

Clicking on the comic leads to an online Google Maps page showing the satellite imagery of the Lena Delta. Traveling south up the river will lead to the city of Yakutsk and eventually to Lake Baikal.

It appears that Cueball is simply trying to explore the world without zooming out the screen. He also seems to keep a log of what he sees onscreen.

Alternatively, he may be playing Mapcrunch, this 'game' randomizes a street view location with the goal of finding the airport. Another possible candidate for what Cueball is playing could be Google Earth Flight Simulator.

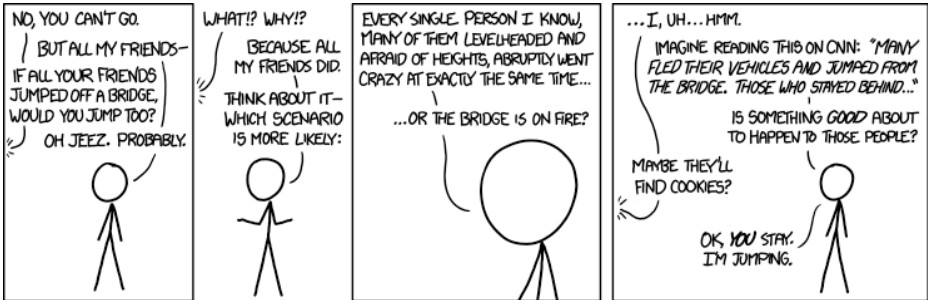
The title text states that he apparently somewhat still treats it as a game and that he has been on it for at least a decade.

A game called GeoGuessr was released three months later, with the user being put into a random location in Google Street View and asked to guess where they are in the world by analyzing clues in their environment. This often necessitates the user making their way from the

middle of the wilderness to some manner of civilization, exactly as in the comic. GeoGuessr would actually get its own comic in 1214.

#1170: Bridge

February 06, 2013



And it says a lot about you that when your friends jump off a bridge en masse, your first thought is apparently 'my friends are all foolish and I won't be like them' and not 'are my friends ok?'.

Explanation

"If all your friends jumped off a bridge, would you jump too?" This is a common question, used to challenge a decision based on the bandwagon effect. It challenges someone to consider whether something is really a good idea, even if everyone else does it (in this case, friends). The sentence is, upon closer analysis, a straw man attack that over-extrapolates the bandwagon effect.

Cueball responds by assuming that if all of his friends jumped off a bridge, there must have been some extreme circumstance that made it logical to do so; for example, that the bridge is on fire. This points out a logical fallacy with the question: if a large group of people all decide to jump off a bridge, there's probably a good reason for them to do so. This is especially true, since the question specifically references "all your friends", which means that these are people who he knows, and are mostly "level-headed and afraid of heights", which makes it unlikely that they're all acting in a random and dangerous way, and much more likely that they're driven by a good reason. A better bandwagon example would be "If all your friends are getting a new phone, would you buy one too?"

The title text suggests that, even if there is nothing wrong with the bridge, the person asking the question is not acting right. The proper reaction to any group of people jumping off a bridge would be concern about the people involved, particularly if all of the people involved are

your friends. If the jump is truly dangerous, he should be concerned for their physical safety, and if the action was truly not justified by the circumstances, then he should be concerned about their mental and emotional state. The implication that he should just dismiss their actions and avoid them seems deeply callous.

#1171: Perl Problems

February 08, 2013



To generate #1 albums, 'jay --help' recommends the -z flag.

Explanation

Perl is a scripting language that makes heavy use of regular expressions, which are good for dealing with large amounts of text quickly. In the comic, the man wearing sunglasses parodies the song "99 Problems" in which the rapper Jay-Z says:

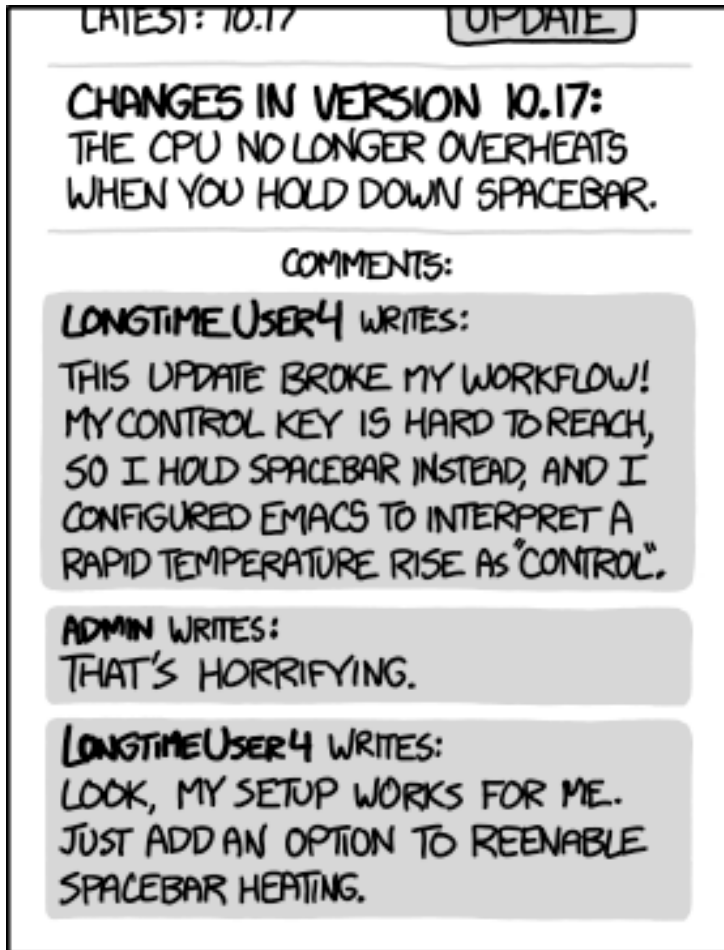
In the comic however, the rapper tries to solve his problems with Perl's regular expressions, and ends up only creating another problem for himself, which is a reference to a famous quote by Jamie Zawinski (whose name could also be shortened to "Jay-Z"): "Some people, when confronted with a problem, think 'I know, I'll use regular expressions.' Now they have two problems." (This quote was revisited in 1313: Regex Golf.)

"program --help" is a common way, originating with the GNU project, to ask a program to show documentation on its usage and supported parameters; which, for some program, could include a "-z" command-line argument ("flag"), so the command would read "jay -z". In this case, it is just an obvious play on the rapper's name. jay is also an actual C program that is a compiler-compiler for java, but it doesn't have a "-z" flag.

This sort of problematically recursive self-reference is reminiscent of comic 927: Standards, and 1739: Fixing Problems.

#1172: Workflow

February 11, 2013



EVERY CHANGE BREAKS SOMEONE'S WORKFLOW.

There are probably children out there holding down spacebar to stay warm in the winter! YOUR UPDATE MURDERS CHILDREN.

Explanation

Users will often try to work around bugs in software, and are sometimes able to get used to having the bugs around. Some bugs are even interpreted as features and users complain when the software authors fix them. This phenomenon has been named Hyrum's law: the law states that whatever the official feature list actually says, if a program has enough users, eventually every behavior of the program (whether intentional, unintentional, or a bug) will be relied upon by someone. A similar effect may be caused by other changes, particularly those which involve alterations of the user interface.

This comic shows a somewhat extreme example. An unnamed application had a bug causing the CPU to overheat whenever the spacebar was held down too long. In version 10.17, this bug was fixed. Soon, LongtimeUser4 complained that they relied on the fact that the CPU overheats if the spacebar is held down. They had stumbled across this "feature" (which is, again, weirder than usual) and took advantage of it to streamline their workflow, and they wanted an option to re-enable it.

Emacs (name originally derived from Editor MACroS) is a text editor originally written at MIT in 1976 and adopted into the GNU project in 1984. The control key sees extensive use in Emacs, and since it's hard to reach, users often remap it to Caps Lock or some other key. LongtimeUser4 fixed the problem very clumsily

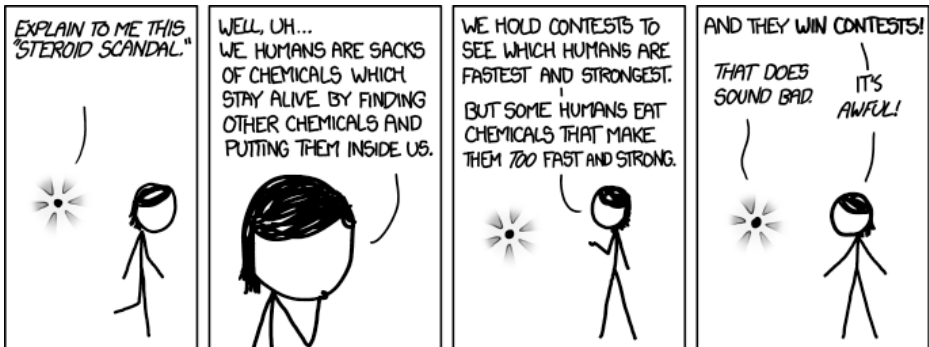
("horrifying," as the admin puts it) and is annoyed that their kludge no longer works. The moral of the story is that you can't please everyone.

Examples of real life changes in software which, though often acclaimed by critics, caused great annoyance among the existing user base include ribbons introduced in Microsoft Office 2007 and the Start screens of both Windows 8 and Unity desktop manager bundled with Ubuntu from versions 11.10 through 17.04. In the latter case, developers included an option to use the older interface; for the rest, applications emulating old behavior were developed by third parties.

The title text makes a hyperbole to humorous effect; children will freeze to death during the winter because they won't be warmed by a rather unconventional heater. Making (or creating an illusion of) a connection between one's opinion and care for children's welfare is a common method of gaining public support, as such arguments are hard to deflect without sounding cruel and uncaring. "holding down spacebar to stay warm" could also be a reference to space heaters.

#1173: Steroids

February 13, 2013



A human is a system for converting dust billions of years ago into dust billions of years from now via a roundabout process which involves checking email a lot.

Explanation

This comic is about steroid usage to enhance humans performance; it is likely inspired by Lance Armstrong's then-recent confession to blood doping in a televised interview with Oprah Winfrey (although Armstrong's confessions did not itself include anabolic steroid use; "steroids" is a common catch-all phrase often misused to reference other forms of doping).

This comic is making the point of the opinion that the criterion about which chemicals (steroids) humans may or may not take in to be considered the strongest or fastest is an artificial criterion. This is demonstrated by Megan explaining the whole concept to an energy sphere representing a non-humanoid intelligence; when framed the way Megan explains it, the explanation sounds rather trivial and silly. A better explanation would be to say that some chemicals make humans faster and stronger but also damage the human body, so these chemicals are banned so the competitors won't destroy themselves. Another point Megan has missed is that the competitions aren't unrestricted, they're designed around specific rules and structures, to which all participants agree. The chemicals in question are a violation of those rules, and so are both dishonest and subvert the entire purpose of the competition.

This comic is one of many instances where Randall attempts to trivialize sports.

The title text changes the perspective again by suggesting that humanity itself is trivial in the grand scheme of things and that really all we are is a "transition" state between old dust and new dust, with a bunch of emailing in between. This is a version of the saying that the Universe is just trying to turn itself into Iron, which is the atom with least energy, and it can thus neither be fused in stars or decay radioactively.

The comic was published on Ash Wednesday (Western liturgical start of Lent). The dust to dust reference calls to mind the charge, "Remember man that thou art dust and unto dust you shall return," which is traditionally spoken by priests as they place ashes on the foreheads of observers on Ash Wednesday, in addition to the idea that all atoms in the universe other than Hydrogen, Helium, and some Lithium, were created after the big-bang via Stellar nucleosynthesis, with further production and dispersal via Supernova nucleosynthesis. Thus the reference by Joni Mitchell in the song Woodstock: "We are stardust..."; and echoed by Carl Sagan: "We are star stuff."

Similar talking floating energy spheres have been used later to represent super intelligent AIs both in 1450: AI-Box Experiment and 2635: Superintelligent AIs, where it is clearly a different sphere and then in the Time traveling Sphere series. There is no indication of it here, but the sphere here could be another time traveler as well, back to try and understand humanity.

#1174: App

February 15, 2013



If I click 'no', I've probably given up on everything, so don't bother taking me to the page I was trying to go to. Just drop me on the homepage. Thanks.

Explanation

Some websites have a mobile app designed for use on mobile devices such as smartphones and tablets. In theory this is because the main website will be more difficult to navigate on the small screen of a mobile, or some features won't work. In practice, this alternative is frequently worse than simply viewing the standard web page, for reasons offered in the comic:

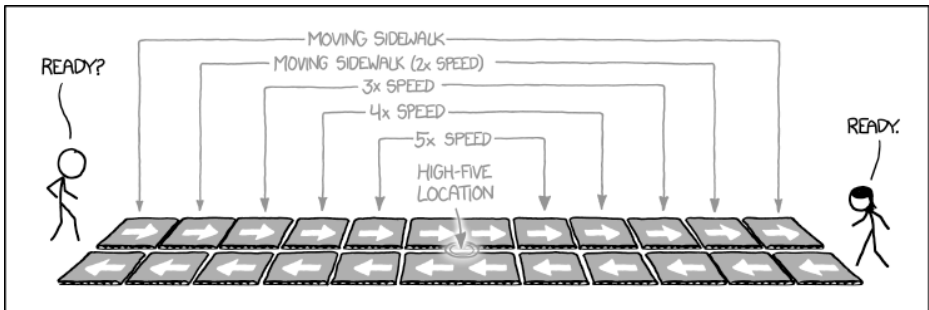
- You cannot zoom or change the text size in most of these apps, a feature available on mobile browsers.
- The app is often of poor quality and is incomplete, lacks part of the content, or lacks features available on the standard website.

The comic offers a brutally honest version of such a promotional popup.

Compounding the frustration is that some sites aggressively promote their app/mobile version with a popup message that repeats the suggestion on every visit to the site, and as the title text notes, if you reject the popup, you end up on the site's homepage, rather than the subpage you may have been trying to reach via a web search. A similar effect (where the mobile version will only load the site's main page) is described in more detail in 869: Server Attention Span.

#1175: Moving Sidewalks

February 18, 2013



I think I could spend hours just stepping on and off of conveyor belts moving at various speeds.

Explanation

Cueball and Megan are getting ready to ride an array of mini-conveyor belts, each going at a speed multiple of the first ones. Assuming they both take the one in front of them, each conveyor belt will speed them up a little bit more with little effort on their part, ultimately reaching a point where they are going very fast and are close enough to be able to high-five each other.

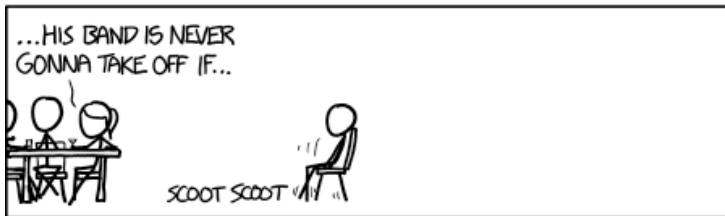
For the most central conveyor belts, there is no speed indicated: it could still be 5x, or a further increase to 6x. No number could also indicate a mere 1x or even a non-moving belt, which would make the whole setup tricky for a much different reason. The average moving walkway speed globally is 3 feet/second (~1m/sec), so Cueball and Megan would only be travelling about 2/3 average human running speed by the time they meet. Even with the opposing forces added to their high five, it would be very unlikely for them to injure each other (though the slap would more than likely be painful). If they are additionally running along their belt setups, it might hurt some more.

The title text may be a reference to a music video made by OK Go, "Here It Goes Again, in which the band jumps on and off of various treadmills in a similar fashion. A series of parallel accelerating conveyor belts is also a long-distance travel mechanism used in Robert A. Heinlein's *The Roads Must Roll* and in Isaac Asimov's *Robot Detective* novels.

#1176: Those Not Present

February 20, 2013

EVERY TIME SOMEONE SAYS SOMETHING NEGATIVE ABOUT A PERSON WHO'S NOT IN THE ROOM, I SCOOT MY CHAIR BACK A FEW INCHES.



'Yeah, that squid's a total asshole.' [scoot scoot]

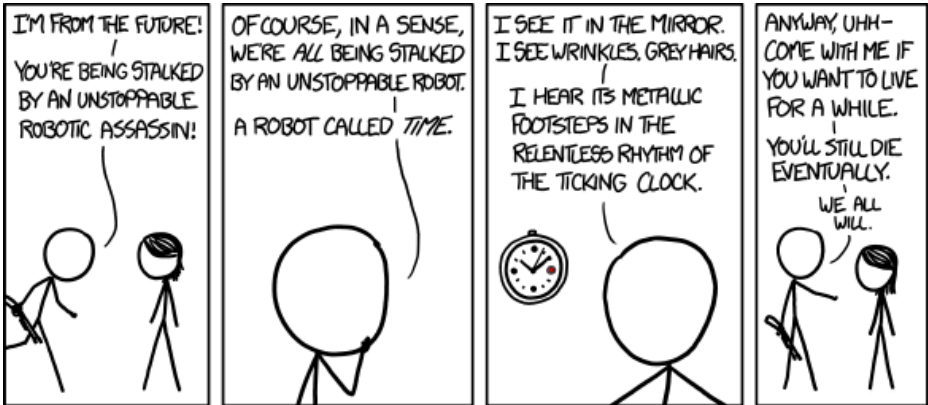
Explanation

Cueball (likely representing Randall), is sitting listening to a conversation with three other people. As the talk progresses, each member contributes gossip about a different group absent from the table, and talking mostly negatively about their qualities and goals. As Cueball notices this, he has decided to leave conversations deemed toxic, by scooting his chair a little bit more farther from the table any time somebody badmouths someone not present. In each panel, he scoots progressively further away, with the previous conversation diminishing as he moves, until he reaches another conversation with Megan, Hairy, and Beret Guy, discussing a blurry video about giant squids. He asks to join them, as this conversation seems far more interesting to him than one criticizing people behind their backs.

The title text jokes that the second group, is, unfortunately, also criticising the giant squid. As the squid is not present, Cueball starts to scoot his chair even more, to hopefully find a non-toxic conversation somewhere else. It is unclear if he is moving to back to where he came from (as possibly the first group seem to be less toxic than the second), or even further onwards (to seek out a new and more palatable conversation).

#1177: Time Robot

February 22, 2013



NO FATE BUT THE NARRATIVES WE IMPOSE ON LIFE'S
RANDOM CHAOS TO DISTRACT OURSELVES FROM OUR
EXISTENTIAL PLIGHT

Explanation

The comic starts with a scene similar to one in the 1984 science fiction action film *The Terminator*. In the movie a killing robot (played by Arnold Schwarzenegger) is sent back in time to kill Sarah Connor, the main female protagonist of the movie. A human, Kyle Reese, also travels back in time to protect her (and he acquires a sawed-off shotgun which Cueball holds in the strip).

However, in the following panels, Cueball explains that, even if he succeeds protecting Megan from the killing robot, we all are hunted by an unstoppable enemy trying to kill us – time. He goes on to point to the similarities between the time and a Terminator. The clock visible in the third panel features a red light in the place of a 3-hour marker, which is a reference to glowing red eyes of a Terminator.

In the final panel, "come with me if you want to live" is a famous phrase from the movie, but in this case, amended with the facts about the inevitability of eventual death, making it much less cool and much less convincing.

Also, the title text is a play on a quote from *The Terminator*, where Sarah Connor starts to believe that "There's no fate but what we make for ourselves.". It is also a reference to the character "Death" in Terry Pratchett's *Discworld* novels. In the *Discworld* novels, Death's voice is always depicted in small caps.

652: More Accurate is also riffing on Kyle Reese's introductory "Come with me if you want to live" line to Sarah Connor. The theme of the inevitability of the ravages of time is underlying 926: Time Vulture.

#1178: Pickup Artists

February 25, 2013



THE WORLD SEEMS LIKE A HAPPIER
PLACE IF YOU THINK "PICKUP ARTIST"
IS LIKE "PICKUP BASKETBALL PLAYER."

It sounds like a great way to make friends! Is it near that Friend Zone you keep talking about? I wanna go!

Explanation

This comic is deliberately conflating two definitions of the word "pickup" to try and discredit one of them.

A pickup artist is a person who considers himself skilled at "picking up" (seducing) women (theoretically a pickup artist could try to seduce men but this is far less common), through various psychological tactics and tricks. They are commonly looked down upon for incredibly jerkish behavior. Meanwhile the term "pickup" in "pickup basketball" means informal and spontaneous. In pickup basketball the players are not part of an organized league or team but rather are just people who are available to play at that time and location.

Beret Guy thinks (or wants to think) that what pickup artists really do is gather spontaneously to practice artistry, like the visual arts. This makes the world seem a happier place, especially considering his own disposition for (eccentric) art, and generally ability to always see the best in every situation.

Randall does not believe that pick-up artists have healthy attitudes towards women and has elaborated on this previously in 1027: Pickup Artist (also featuring Hairy) and in 800: Beautiful Dream.

The title text also shows Beret Guy's belief that the "friend zone" is a physical place. The term "friend zone" refers to a state in which one party (almost always male)

desires a romantic or sexual relationship with someone (almost always female) who only thinks of them as a friend, with the notion that being classified as a friend is blocking them from being considered as a romantic partner. The use of this term has become quite controversial, however, because it implies that the man considers himself entitled to a romantic relationship in which the woman has no interest. References to being in "the friend zone" is almost universally stated as a complaint, and the other party's desires is treated as an obstacle to be overcome, often through manipulation and deception. Randall previously expressed criticism towards trying to just slip into a romantic relationship from the friend zone in 513: Friends.

Beret Guy however believes (or chooses to believe) that the term refers to a physical place that's either full of friends, or a place where people go to make friends. In either case, he thinks such a 'zone' sounds fun.

#1179: ISO 8601

February 27, 2013

PUBLIC SERVICE ANNOUNCEMENT: OUR DIFFERENT WAYS OF WRITING DATES TO NUMBERS CAN LEAD TO ONLINE CONFUSION. THAT'S WHY IN 1988 ISO SET A GLOBAL STANDARD WRITING DATE NUMBER. THIS IS THE CORRECT WAY TO WRITE NUMERIC DATES.	PUBLIC SERVICE ANNOUNCEMENT: OUR DIFFERENT WAYS OF WRITING DATES TO NUMBERS CAN LEAD TO ONLINE CONFUSION. THAT'S WHY IN 1988 ISO SET A GLOBAL STANDARD WRITING DATE NUMBER. THIS IS THE CORRECT WAY TO WRITE NUMERIC DATES.	PUBLIC SERVICE ANNOUNCEMENT: OUR DIFFERENT WAYS OF WRITING DATES TO NUMBERS CAN LEAD TO ONLINE CONFUSION. THAT'S WHY IN 1988 ISO SET A GLOBAL STANDARD WRITING DATE NUMBER. THIS IS THE CORRECT WAY TO WRITE NUMERIC DATES.
<p>2013-02-27</p> <p>THE FOLLOWING DATES ARE THEREFORE DISCOURAGED:</p> <p>02/27/2013 02/27/13 27/02/2013 27/02/13 20130227 20130227 270213 27-02-13 7/27/13 2013.02.27 27/02 2013/02/27 MMXXIII II XXVII MMXXIII II 13022013000 (2=0-011+)-1-3/3-1/3 2013 02/27/13 02/27/13 02/27</p>	<p>2013-02-27</p> <p>THE FOLLOWING DATES ARE THEREFORE DISCOURAGED:</p> <p>02/27/2013 02/27/13 27/02/2013 27/02/13 20130227 20130227 270213 27-02-13 2/27/13 2013.02.27 27-02 2013/02/27 MMXXIII II XXVII MMXXIII II 13022013000 (2=0-011+)-1-3/3-1/3 2013 02/27/13 02/27/13 02/27</p>	<p>2013-02-27</p> <p>THE FOLLOWING DATES ARE THEREFORE DISCOURAGED:</p> <p>02/27/2013 02/27/13 27/02/2013 27/02/13 20130227 20130227 270213 27-02-13 27-02-13 2013.02.27 27-02 2013/02/27 MMXXIII II XXVII MMXXIII II 13022013000 (2=0-011+)-1-3/3-1/3 2013 02/27/13 02/27/13 02/27</p>

ISO 8601 was published on 06/05/88 and most recently amended on 12/01/04.

Explanation

When abbreviating the date into numerical form, various areas of the world tend to list the year, month, and day in different orders (as well as with different delimiting symbols), which can cause confusion particularly when the day value is 12 or lower allowing it to be easily interpreted as the month and vice versa. As a public service announcement, this comic states that there is in fact one international standard for writing numeric dates, set by the International Organization for Standardization in its ISO 8601 standard: YYYY-MM-DD.

The comic then proceeds to list several discouraged ways of writing out the date of the comic's publication, as they do not match the standard. It begins with several commonly used ones in countries around the world but then begins to list increasingly uncommon ways, ranging from strange (Roman numerals) to quirky (binary, Unix time) to essentially impossible (painting the numbers onto a black cat).

The title text provides a perfect example of the kind of ambiguity that can arise when non-standard formats are used. The ISO standard was in fact published on 1988-06-05 and amended on 2004-12-01. This is mentioned in the title text in MM/DD/YY format; however, there is no way to naturally figure this out, particularly with the second date.

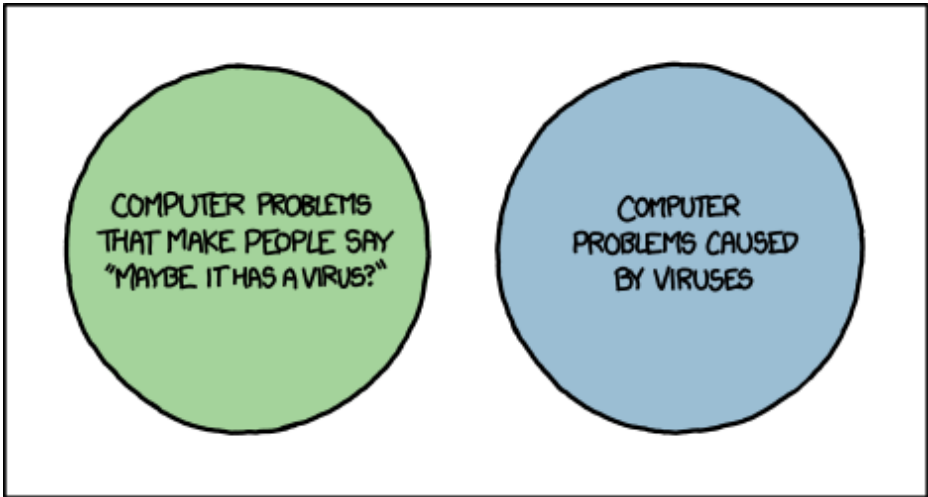
With the year truncated to two digits and all three numbers at 12 or lower, the date referring to December 1, 2004 (the digits pairs 12, 01 and 04) has a number of misinterpretations. Usually 12th Jan '04 (if written as US-style but read as European, or vice-versa) but with ISO-influenced "YY MM DD" ordering as one side or other of the misunderstanding it can easily become the 12th day of April 2001, the 4th day of December 2001 and the 4th of January 2012. It takes two such communication errors to 'become' the 1st day of April 2012.

Date formats were again the subject in 1340: Unique Date and 2562: Formatting Meeting.

The other mentioned formats are:

#1180: Virus Venn Diagram

March 01, 2013



Within five minutes of the Singularity appearing, somebody will suggest defragging it.

Explanation

Randall uses an Euler diagram (technically not a Venn diagram) to make fun of clueless computer users. The circles in the diagram don't overlap, meaning problems that people suspect are caused by viruses are never really caused by viruses, and problems that are actually caused by viruses are never suspected by people to be caused by a virus.

When computers don't function as expected, a common response from ordinary users is "Maybe it has a virus?". However, most of these situations can be explained by faulty hardware (freezing, blue screen, etc.) or software (crashes, errors, apparent lack of response to input, etc.), a general lack of maintenance (too slow to start up, too much clutter on screen, etc.), or user error. A virus can potentially cause those symptoms, but it's much more common for them either to cause immediate and massive damage (rendering the computer completely unusable, wipe the disk, display obvious propaganda, etc.), or to remain stealthy with no obvious symptoms (logging keystrokes, exfiltrating sensitive information, receiving commands in the background, etc.). Of course there is no clear separation and there is always some overlap between the two scenarios, so the diagram is not meant to be taken literally.

The title text refers to the technological singularity, a hypothetical point in the future when superintelligence emerges in computers, so that they can build new

computers with ever increasing intelligence. It is seen as impossible to predict what would happen beyond this point; hence the term "singularity". 1084: Server Problem makes a joke on this.

"Defragging" is short for disk defragmentation, an easy, user-friendly action that PC users can undertake to supposedly make their computers run faster. It is therefore a common all-round recommendation to do this, regardless of the problem. Randall suggests the same clueless users would encounter the singularity and attempt defragging. It probably won't help much.[citation needed]

#1181: PGP

March 04, 2013

HOW TO USE PGP TO VERIFY THAT AN EMAIL IS AUTHENTIC:

LOOK FOR THIS
TEXT AT THE TOP:



IF IT'S THERE, THE EMAIL IS PROBABLY FINE.

If you want to be extra safe, check that there's a big block of jumbled characters at the bottom.

Explanation

PGP (Pretty Good Privacy) is a program which can be used to encrypt and/or sign data, including messages sent as emails. Encrypting means encoding data in a way that requires a secret key to decrypt and read; signing means that there is a code included in the data which can be used to verify the identity of the sender and that the data has not been altered in transit.

In the case of the email in this comic, it has only been signed; not encrypted (hence, the top of the first line of text can be seen and is legible in normal English). This is more common than encryption, as reading an encrypted message would require the recipient to already be a PGP user. In fact, the use of PGP even to sign email messages is so rare that most people have probably never seen a signed message. Because a signed email is so rare, and because it is already legible and unencrypted, Randall is making the tongue-in-cheek observation that few users, technical or otherwise, actually know how to use the signature to verify the authenticity of the sender using the PGP signature, and that such users can safely assume that since there is a signature, that is good enough evidence that the message is authentic. Further, because PGP signatures are so rare and probably ignored by most recipients, he suggests one would not expect anyone to even bother creating a false PGP signature; therefore the mere existence of a PGP header would suggest authenticity.

The title text extends the joke by suggesting you confirm there's a bunch of random characters in the footer (this is the actual signature that PGP generates which can be used to verify the authenticity of the email). Again, Randall is humorously suggesting that the existence of the block is itself sure evidence of authenticity.

#1182: Rembrandt Photo

March 06, 2013



::click:: Come back! You didn't see the one of Whistler's mother!

Explanation

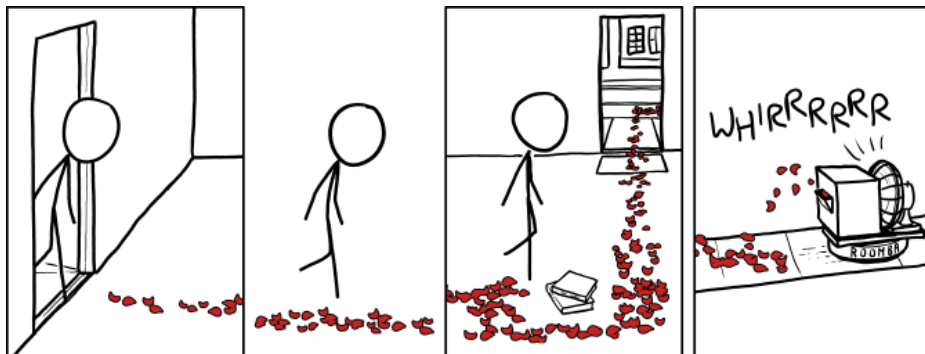
Rembrandt was a 17th-century Dutch artist. Megan shows Cueball an alleged photo of Rembrandt's parents at the time that his mother became pregnant; his conception. Since photography wasn't invented until the 19th century, it can't be a real photo. Megan responds to Cueball's disbelief by stating that it is an artist's conception: an artistic imagination and depiction of an event.

The joke thus is a pun on the phrase 'artist's conception' that can mean two different things: one, Rembrandt's mother becoming pregnant with him and two, the creation of the image.

The title text refers to James McNeill Whistler who painted a portrait of his mother, known to Whistler himself as "Arrangement in Grey and Black No1" but more commonly known as "Whistler's Mother". As a joke on this, Megan seems to want to show a photo of Whistler's mother, which would probably be pornographic or at least different from the famous portrait. The ::click:: is Megan switching to that picture on her laptop.

#1183: Rose Petals

March 08, 2013



Joke's on you--the Roomba and I had a **LOVELY** evening.

Explanation

This comic strip is playing with romantic movies and gestures used in them. In such movies, one often used romantic gesture is spreading rose petals in the house or apartment, making a way towards the bedroom in which a romantic interest/lover is waiting surrounded by roses for a love-making session. The joke is that these petals don't lead from the front door to the bedroom and Cueball's lover, but in the opposite direction instead from the bedroom out onto the street. It appears that someone has set up a box of rose petals and an electric fan atop a Roomba (an autonomous robotic vacuum cleaner) as a method of automatically creating such a trail. The title text suggests that despite the other party's intentions of setting this up as a joke to trick Cueball, Cueball ended up having a lovely time with the Roomba.

#1184: Circumference Formula

March 11, 2013

CIRCUMFERENCE OF A CIRCLE:

$$2\pi r^2$$

²THE CIRCLE'S RADIUS

Assume r' refers to the radius of Earth Prime, and r'' means radius in inches.

Explanation

The circumference C of a circle is $2\pi r$, where r is the radius of the circle. Randall then makes a footnote about r , using 2. This creates a typographical ambiguity, since a superscript 2 can also be an exponent (as in x^2). The comical purpose of this ambiguity is that the formula initially makes an appearance of a mistake and confusion with the formula for the area of the circle: $A = \pi r^2$. If and only if the reader realizes that the superscript text is a reference to a footnote will they understand that the author has in fact supplied the correct formula. The comic 1208: Footnote Labyrinths is another joke on footnotes.

The title text makes a related joke. Randall has used r' (r-prime) and r'' (r-prime-prime, typically pronounced as r double prime). Like many symbols, prime has widely differing meanings depending on context. In mathematics prime is often employed to distinguish corresponding components in analogous systems. For example, in a description of a basic physical system, if the velocity of an object is denoted with the variable v , the velocity of that object at time=0 may be denoted with v' . Playing off this use of prime, Randall has selected the radius of Earth Prime, a concept used in speculative fiction with parallel universes and multiple Earths. Earth Prime is our Earth (or at least the Earth from which the protagonists originate).

However, other disciplines use prime to mean other

things. In timekeeping and navigation ' denotes minutes (fractions of hours or degrees, respectively) and " denotes seconds (fractions of minutes). In the United States and some other places not using meters to measure distance, ' denotes feet and " denotes inches. The suggestion of using r' or r'' does not cause any mathematical confusion, but using the former to denote the radius of a specific object and the latter to denote a radius using a specific unit of measurement would be highly esoteric. Furthermore, r' and r'' can be used in calculus as a method of denoting, respectively, a first derivative and a second derivative. For someone attempting to use the formula and some derivative representing a circle's radius, trouble could result quite easily.

#1185: Ineffective Sorts

March 13, 2013

INEFFECTIVE SORTS

```
DEFINE HALFHEARTEDMERGESORT(LIST):  
  IF LENGTH(LIST) < 2:  
    RETURN LIST  
  PIVOT = INT(LENGTH(LIST) / 2)  
  A = HALFHEARTEDMERGESORT(LIST[:PIVOT])  
  B = HALFHEARTEDMERGESORT(LIST[PIVOT:])  
  // UMMMMMM  
  RETURN [A, B] // HERE. SORRY.
```

```
DEFINE FASTBOGOSORT(LIST):  
  // AN OPTIMIZED BOGOSORT  
  // RUNS IN O(N LOG N)  
  FOR N FROM 1 TO LOG(LENGTH(LIST)):  
    SHUFFLE(LIST):  
  IF ISSORTED(LIST):  
    RETURN LIST  
  RETURN "KERNEL PAGE FAULT (ERROR CODE: 2)"
```

```
DEFINE JOBININTERVIEWQUICKSORT(LIST):  
  OK SO YOU CHOOSE A PIVOT  
  THEN DIVIDE THE LIST IN HALF  
  FOR EACH HALF:  
    CHECK TO SEE IF IT'S SORTED  
    NO, WAIT, IT DOESN'T MATTER  
    COMPARE EACH ELEMENT TO THE PIVOT  
    THE BIGGER ONES GO IN A NEW LIST  
    THE EQUAL ONES GO INTO, UH  
    THE SECOND LIST FROM BEFORE  
  HANG ON, LET ME NAME THE LISTS  
  THIS IS LIST A  
  THE NEW ONE IS LIST B  
  PUT THE BIG ONES INTO LIST B  
  NOW TAKE THE SECOND LIST  
  CALL IT LIST, UH, A2  
  WHICH ONE WAS THE PIVOT IN?  
  SCRATCH ALL THAT  
  IT JUST RECURSIVELY CALLS ITSELF  
  UNTIL BOTH LISTS ARE EMPTY  
  RIGHT?  
  NOT EMPTY, BUT YOU KNOW WHAT I MEAN  
  AM I ALLOWED TO USE THE STANDARD LIBRARIES?
```

```
DEFINE PANICSORT(LIST):  
  IF ISSORTED(LIST):  
    RETURN LIST  
  FOR N FROM 1 TO 10000:  
    PIVOT = RANDOM(0, LENGTH(LIST))  
    LIST = LIST[PIVOT:] + LIST[:PIVOT]  
  IF ISSORTED(LIST):  
    RETURN LIST  
  IF ISSORTED(LIST):  
    RETURN LIST  
  IF ISSORTED(LIST): // THIS CAN'T BE HAPPENING  
    RETURN LIST  
  IF ISSORTED(LIST): // COME ON COME ON  
    RETURN LIST  
  // OH JEEZ  
  // I'M GONNA BE IN SO MUCH TROUBLE  
  LIST = []  
  SYSTEM("SHUTDOWN -H +5")  
  SYSTEM("RM -RF ./")  
  SYSTEM("RM -RF ~/*")  
  SYSTEM("RM -RF /")  
  SYSTEM("RD /S /Q C:\*") // PORTABILITY  
  RETURN [1, 2, 3, 4, 5]
```

StackSort connects to StackOverflow, searches for 'sort a list', and downloads and runs code snippets until the list is sorted.

Explanation

The comic gives examples of four non-functional sorting algorithms written in pseudo-Python.

The first sort is an unfinished merge sort. The merge sort works recursively by dividing a list in half and performing a merge sort to each half. After the two halves are sorted, they are merged, taking advantage of the fact that the two halves are now in correct order and thus the merge can be done efficiently. The author of the merge sort in the comic appears to have given up on writing the sorted-merge part of the sort, which is why it's a half-hearted merge sort, but instead concatenates the halves without sorting. In its current state, the sort would divide the list into elements of size one, then recombine them in their original unsorted order, but in nested lists - making the original data more difficult to work with. The author acknowledges this failing with the comment "Ummmmm... Here. Sorry."

The second sort is an "optimized" variant of bogosort. A standard bogosort works by randomly shuffling the elements in the list until they are sorted. In a comment, the author points out that this variant of bogosort runs in $O(n \log(n))$, whereas standard bogosorts actually have an expected runtime of $O(n \cdot n!)$ but may never finish. This variant of bogosort finishes so much faster because in most cases it does not actually sort the list, instead reporting a fictitious error in the operating system (a "kernel page fault") if the list isn't ordered after shuffling

$\log(n)$ times. The bogosort is "optimized" because no comparison sort algorithm can possibly do better than $O(n \log(n))$ in the worst case.

The third sort parodies a programmer explaining a quicksort during a job interview. The quicksort works by choosing an index as a pivot value and sorting all elements less than the pivot before the pivot and all the elements greater than the pivot after the pivot. It then does a quicksort to the section less than the pivot and the section greater than the pivot until the whole list is sorted. The interviewee flounders for a little while, then asks whether they can use the standard libraries to call a quicksort. The joke being, the standard library contains a quicksort, and the programmer would rather rely on that (possibly even pass it off as his own work) than his own example of quicksort. While it's commonly a good idea in real projects, this would surely count as a failure on interview.

The final sort is just a mess. First it checks to see if the list is sorted, and exits if it is. Then it rotates the list by a random amount 10,000 times (as if cutting a deck of cards) and exits if the list is ever sorted. Next, in desperation, it checks if the list is sorted three times. Finally, realizing that they have no chance of success, the author performs the computer equivalent of a Rage Quit and attempts to destroy the computer rather than admit defeat. First, the program attempts to schedule a shutdown of the computer in five minutes, then attempts to delete the current directory, then attempts to delete the user's home directory (presumably the grader's

files), and finally all the files on the computer. `rm` is a POSIX command; the `-r` and `-f` flags mean that the remove command will remove all contents of the specified directories and will not prompt the user beforehand. Under the guise of "portability", the program runs the equivalent Windows `rd` command with switches to delete all files from the "C:" drive without prompting. Finally, the program returns a list containing the numbers one through five in order.

In the title text, [StackOverflow \(link\)](#) is a question-and-answer site where programmers can ask and answer questions on programming. The author of this code takes advantage of the hopes that someone on StackOverflow knows what they are doing and has posted code to sort a list... and somebody implemented `stacksort`; well, sort of.

#1186: Bumblebees

March 15, 2013

SCIENCE FACT:



**PHYSICISTS STILL CAN'T EXPLAIN HOW
BUMBLEBEES CAN FLY AIRPLANES.**

Did you know sociologists can't explain why people keep repeating that urban legend about bumblebees not being able to fly!?

Explanation

This is the first comic using a fact that is not a Fun fact. Instead it is a Science Fact.

There is an often repeated legend that according to the laws of aerodynamics, bumblebees cannot fly. No theories of aerodynamics or mechanics have ever claimed such a thing, and the legend likely originates from a mathematical error that appeared in a 1934 book, written by a scientist who acknowledged that the conclusion was probably wrong.

Here, Randall makes fun of the urban legend with some wordplay. "Fly" in English can refer to both flying under one's own power and the act of piloting a flying vehicle. The comic puts a bumblebee on top of a control column inside of an airplane and lets it fly the entire plane. But physicists are still confused and don't know how the bees are able accomplish this.

The strip also creates a fallacy that when experts can't explain something, they must not be able to understand it. In this particular case, experts are unable to explain why bees can fly airplanes because they can't fly airplanes.[citation needed]

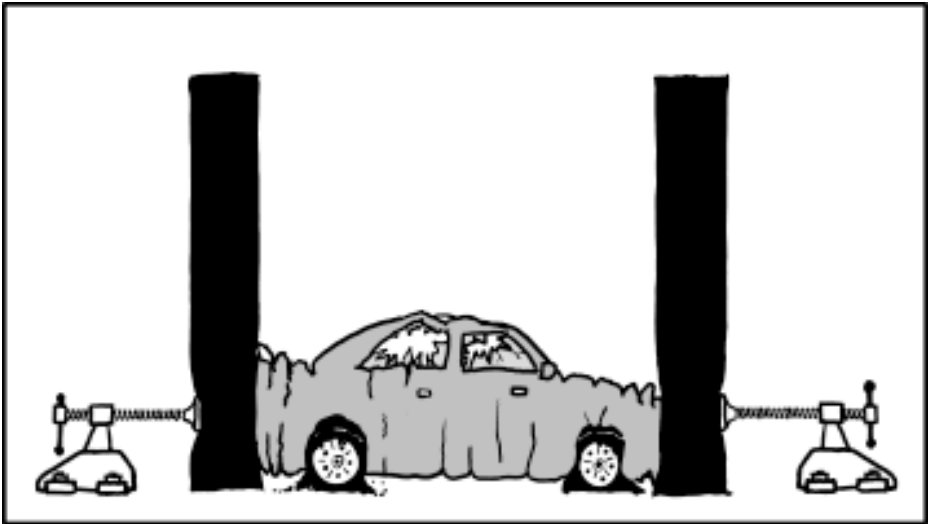
This strip could be a reference to Bee Movie, in which the main character, Barry B. Benson, enlists the help of other bees to land a plane with the last reserves of pollen on Earth. The opening quote of the movie repeats the

Bumblebee legend, followed by saying, "The bee, of course, flies anyway, because bees don't care what humans think is impossible."

The title text mentions that sociologists are also unable to explain why many people repeat this obviously wrong urban legend.

#1187: Aspect Ratio

March 18, 2013



WHENEVER SOMEONE UPLOADS A LETTERBOXED
16:9 VIDEO RESCALED TO 4:3, I DO THIS TO THEIR CAR.

I'm always disappointed when 'Anamorphic Widescreen'
doesn't refer to a widescreen *Animorphs* movie.

Explanation

Aspect ratio is the relationship between the width and height of an image (and in this case, a video) and is denoted in a ratio of <width>:<height> - usually either in lowest common denominator, or with a decimal width to a height of "1". Up until the 1990s, all televisions and most computer monitors (CRT tube and LCD) were in the standard 4:3 aspect ratio, called "fullscreen" (meaning the width is $\frac{4}{3}$ or 1.33... times the height). When HDTV was developed, the standard for television screens changed to 16:9 (width being $\frac{16}{9}$ or 1.77... times the height), called "widescreen" (although widescreen can also refer to a number of even wider ratios used in feature films).

Letterboxing is a process whereby an image which does not fully fill a screen is expanded to fill the screen by the addition of further material (mattes). Usually this is done with the addition of black bars in the empty space. One example of why this was necessary was widescreen films on VHS cassette. VHS could only record and play back 4:3 images. Thus, in order to display a widescreen film, the rest of the VHS's 4:3 image had to be filled with horizontal black bars at the top and bottom of the image. Those bars were part of the video information recorded on the cassette.

When DVDs were introduced, many DVDs also had letterbox bars on the DVD's full screen image. With the increased popularity of widescreen televisions, DVD

players were improved to offer anamorphic widescreen, in which the full widescreen image is horizontally rescaled (shrunk) into a 4:3 size, which the player then was able to display stretched horizontally back to the proper widescreen aspect.

With the advent of Blu-ray, video is generally encoded in whatever its proper aspect ratio is intended to be, and the player itself is left to appropriately matte the image.

The problem with letterboxed video (such as a 16:9 video letterboxed for 4:3) is that if one tries to watch the video on a 16:9 widescreen, where the image should fill the whole screen, instead the 4:3 letterboxed image fills part of the screen with further vertical mattes on the left and right of the image, thus producing an image much smaller than it needs to be, with mattes on all four sides. Some TVs or media players can zoom to help resolve the issue, although the video resolution usually suffers. By encoding only the video itself and allowing the player to do the matting, the video can be seen as large as possible on any given screen.

In this comic, Randall appears to be complaining about the issue of widescreen videos which have been rescaled to 4:3 by "squashing" the video horizontally to make it narrower, and in the process causing everything to appear thinner/taller than it really is, causing an unpleasant experience. This is akin to crushing a car to the 3:4 ratio while putting black bars on both sides, which Randall uses as disproportionate retribution.

A note is that, if someone managed to "expand" the car, the car would not be "un-crushed" and probably even destroyed even more, referencing the bigger damage done when "squashed" video is attempted to be "expanded" to its original ratio, distorting the video quality. When an image is converted to 3:4, the pixels are resized to squares. When resized to 16:9, the pixels therefore have a longer side and a shorter side.

In the title text, Animorphs is a late-90's to early-00's young adult book series about shape-shifting teens who turn into animals to fight body-snatching aliens. Sony held the rights to create a film, but never made use of them, beyond creating URLs for a proposed movie on December 11, 2012. Animorphs has since been mentioned in the title text of 1360: Old Files as well as being the main joke in 1380: Manual for Civilization and 1817: Incognito Mode.

#1188: Bonding

March 20, 2013

```
CLASS BALL EXTENDS THROWABLE {}  
CLASS P {  
    P TARGET;  
    P(P TARGET) {  
        THIS.TARGET = TARGET;  
    }  
    VOID AIM(BALL BALL) {  
        TRY {  
            THROW BALL;  
        }  
        CATCH (BALL B) {  
            TARGET.AIM(B);  
        }  
    }  
    PUBLIC STATIC VOID MAIN(STRING[] ARGS) {  
        P PARENT = NEW P(NULL);  
        P CHILD = NEW P(PARENT);  
        PARENT.TARGET = CHILD;  
        PARENT.AIM(NEW BALL());  
    }  
}
```

I'm trying to build character but Eclipse is really confusing.

Explanation

This is source code written in the Java programming language which models a parent and a child playing a game of catch. Normally this game is played with the parent throwing a ball to their child, who catches it and throws it back, and repeated back-and-forth. The comic title "Bonding" refers to the building of relationship between the parent and the child. The joke lies in the puns using the words try, throw, catch, and Throwable. These can refer to actions in the real-life game, but are also keywords in the Java language that are used for exception handling, a method of signaling error conditions and responding to them. Also, the terms "parent" and "child" are usually interpreted more abstractly in programming, as generic terms used in hierarchical data structures.

The program, as written, will recursively call the aim method alternately on the parent and the child indefinitely, causing each to take turns throwing and catching the Ball object. Note that unlike the real game, this program actually has the same person both throwing and catching the same ball on their turn. The ball is passed onto the other person by aiming it at them, which causes the person to both throw and catch the ball, and aim it back, perpetuating the cycle. This program will also eventually crash with a stack overflow error.

The title text refers to the Eclipse IDE, which is a tool commonly used to develop software in Java. "Building

character" is something that you would expect a parent to do, in order to instill in his child positive traits, such as confidence and athleticism. This is possibly a reference to Calvin and Hobbes, where Calvin's dad often encourages him to build character in a number of ways, including playing baseball. This is made more likely by other references combining technology with Calvin and Hobbes, such as xkcd comics 409: Electric Skateboard (Double Comic), 702: Snow Tracking and 1002: Game AIs. However, here, "build" might also be a play on the term of "building" a program, while "character" refers to a data type in programming languages. It may also refer to the common notion that programming in C++ or Java builds character due to their powerful but sometimes finicky libraries.

Program description[edit]

To compile this Java source code, the two classes would need to be in a .java file.

The program defines two classes (types of objects):

The program executes in the following order:

#1189: Voyager 1

March 22, 2013

NUMBER OF TIMES
VOYAGER 1 HAS
LEFT THE SOLAR SYSTEM

//

So far Voyager 1 has 'left the Solar System' by passing through the termination shock three times, the heliopause twice, and once each through the heliosheath, heliosphere, heliopause, auroral discontinuity, Heaviside layer,

trans-Neptunian panic zone, magnetogap, US Census Bureau Solar System statistical boundary, Kuiper gauntlet, Oort void, and crystal sphere holding the fixed stars.

Explanation

Voyager 1 is a U.S. space probe launched in 1977 to study the outer reaches of the Solar System and beyond. Popular press has on several occasions announced that it "has left the solar system" at each point when a boundary has been confirmed or a major event has taken place. This underscores the fact that there is no strictly defined and recognizable boundary of the solar system, or at least we haven't found one yet.

On the day of this comic's release (2013-03-22) it was announced that Voyager 1 had entered a new region of space. At this point Voyager 1 had passed through the Heliopause and entered the Interstellar medium, although this latter was first confirmed about half a year later in September 2013.

The chart shows that Voyager 1 has left the Solar System 22 times, but in the title text only 16 are mentioned.

The title text lists several such possible boundaries, (and how many times Voyager 1 has passed them) together with fictive humorous ones:

Real boundaries[edit]

- Three times:

The termination shock—the point in the heliosphere where the solar wind slows down to subsonic speed (relative to the star) because of interactions with the local interstellar medium. When

exactly Voyager 1 passed the Termination shock is not clear and on Wikipedia there are given dates of 2003, 2004 and 2005. The final estimate was that it happened late in 2004. (Thus fitting with three times).

- Twice:

The heliopause—the theoretical boundary where the Sun's solar wind is stopped by the interstellar medium. It was first reported in 2012 that Voyager 1 had reached the Heliopause, but first on the day of this comics release was it officially announced that it had passed through to the interstellar medium. (Thus fitting with two times).

- Once:

The heliosphere—a region of space dominated by Earth's Sun, a sort of bubble of charged particles in the space surrounding the Solar System—we live inside this region. At its boundary there are three named borders which are the real ones mentioned before and after this in the title text. From inside to out they are: The termination shock, the heliosheath and the heliopause. The reason the other two are mentioned first is that they have occurred more than once, and the list begins with those for that reason. As these other three borders are also part of the heliosphere, with the heliopause being the outer border of the heliosphere, then Voyager 1 will have left the heliosphere at the same time as it left the heliopause.

The heliosheath—the region of the heliosphere beyond the termination shock. It was confirmed that Voyager 1 passed through this at the end of 2010, so this occurred two years before the Heliopause was reached. But since it only happened once, it is

mentioned after the first two, and maybe after the heliosphere because it is inside this region?

Fictional boundaries[edit]

- Heliodrome—yet another composition of helios "sun," here together with dromos "course". There is no astronomical object with this name, but it has been used variously in other contexts. One that became famous is a sports hall which was used as a concentration camp in the Bosnian war, see Heliodrom camp.
- Auroral discontinuity—another fictitious astronomic object, for auroral see Aurora (astronomy).
- Heaviside layer—a layer of ionized gas occurring between roughly 90–150 km (56–93 mi) above the ground in the Earth's atmosphere. Popularly recognized for its use as a reference to Heaven in the writings of T. S. Eliot adapted into Andrew Lloyd Webber's musical Cats. (While Voyager 1 did indeed pass through this boundary during launch, it is absurd to suggest it as a boundary of the solar system.)
- Trans-Neptunian panic zone—this fictional zone combines the word from two subjects: "Trans-Neptunian" is used in astronomy to describe stuff that occurs beyond the planet Neptune. In Outdoor education the "panic zone" is the opposite of the comfort zone when trying to learn new stuff.
- Magnetogap – part of an ignition system.
- US Census Bureau Solar System statistical boundary—a fictitious boundary supposedly defined by the United States Census Bureau, similarly to how it defines census areas for the purpose of processing statistical data about regions in the United States. In this case, the Bureau's boundary for

determining the population of the solar system.

- Kuiper gauntlet—this is a play on the Kuiper belt, which is a region of the Solar System beyond the planets, extending from the orbit of Neptune (at 30 AU) to approximately 50 AU from the Sun, notable for being full of asteroids; replacing the word "belt" with "gauntlet (glove)" (often spelled 'gantlet') which is a protective glove as well as "gauntlet (punishment)" which is a medieval punishment where one would be forced to run through two lines of men who would hit the punishee.
- Oort void—refers to the Oort cloud, a gigantic "cloud" of materials (mainly composed of ice) which ends around a light-year from The Sun and is deemed the (current) "edge" of the solar system. The "void" may be pun on density of that "cloud" - the number of bodies in it may be huge, but given its size, it's mostly empty.
- Crystal sphere holding the fixed stars—this refers to historical ideas about the universe, particularly the Ptolemaic system, in which the stars were supposed to be fixed on a large crystal sphere around the Earth. It might also be referencing "The Crystal Spheres", a short story by David Brin, in which humanity's first interstellar ship shatters a previously undetected, protective barrier around the solar system. It may also be a reference to the Dungeons and Dragons setting "Spelljammer". A crystal sphere around the solar system can also be seen in 2765: Escape Speed.
- Total count above reaches 16 exits from the solar system vs. 22 in the comic itself.

See also Voyager over the "heliocliff," but Solar System transition mysterious on Ars Technica.

About eight years later, Voyager 1 leaving the solar system was brought up again in 2414: Solar System Compression Artifacts.

#1190: Time

March 25, 2013



The end.

Explanation

Beginning with a single frame published at midnight on March 25, 2013, the image was updated every 30 minutes until March 30, 2013, and then every hour for 118 days (123 days in total), ending on July 26 with a total of 3,102 unique images. Each image represented a single frame in a larger story, set in the far future, at a time when the Strait of Gibraltar has long been blocked and the Mediterranean Sea has largely dried up leaving smaller, hypersaline seas behind. Megan and Cueball, living on the shores of one of these seas and unaware of its natural history, notice one day while building a huge sand castle on the beach that the sea level is starting to rise. They start a journey of exploration trying to find out why. Eventually they discover that the Straits of Gibraltar have once again been breached, and that the Mediterranean Basin is being flooded. They run back to their home, assemble the people of their village, and board a makeshift raft. At the end they reach land with their rafts, searching for a new home.

On frame 2925 the title text changed from "Wait for it." to "...", and one frame later to just "RUN.". At approximately 2944, when Megan announces that it is too late to escape overland, the title text changed back to "...". On frame 3094, the words THE END appear in the middle of the screen and the title text changed to "The end.". The image now links to the scrollable collection of frames at geekwagon.net/projects/xkcd1190/. The comic on xkcd.com today currently loops through the

last five frames of the comic.

Format[edit]

This comic is a series of images which play as a rough animation. The pictures were updated over the course of time. The comic ran for 2973 hours (over 124 days) and consists of 3101 image frames. For the first 120 hours, a new frame replaced the previous frame every 30 minutes, at :00 and :30 of each hour; the remaining frames have since been revealed every hour. The update was done server-side, with the server redirecting the image link (time.png) to a different image every hour. The source images have very long random hash names, which made it virtually impossible to access future frames. There is no way to view past frames on the official xkcd website, and only the current frame is posted there at any given time. Given the unique nature of this comic, the full image archives can be browsed through several websites that have been dedicated to tracking it (see below).

Readers typically have divided the comic into four scenes (see below). For example, at 850 hours (36 days 10 hours) the first "scene" of the comic ended at frame 971 with a fade to white, ushering in a second scene from frame 972. Some of the last few frames of scene 1 are nearly white, but faint images can be seen in the normalized pictures available below (Day 36, Monday, April 29, 2013, normalized).

Reception[edit]

- The comic was awarded the 2014 Hugo Award for Best Graphic Story.
- The comic garnered "obsessive" attention from viewers on xkcd's forum, with a discussion thread exceeding 2,500 pages

and 100,000 posts.

- "Time" had developed a fanatical following that pored over every update pixel by pixel and gathered online to trade theories, decipher clues, and even write songs.
- The comic has its very own wiki with over a thousand pages on that one strip.
- The comic has its own article on Wikipedia.
- The Verge's Jeff Blagdon called the journey "epic".
- Wired's Laura Hudson also suitably referred the comic strip as "epic".
- The story was also reported by Washington Post's Andrea Peterson.
- Cory Doctorow of Boing Boing saying it was "coming along nicely" during publishing with an "astounding backstory" upon its conclusion.

Extra Time pages[edit]

Since this comic is so complicated, extra pages have been created to include much more information than is wished for on this main page. These pages are listed here for convenience, but they are also linked in the relevant sections below:

- 1190: Time/Transcript - The full transcript of the entire comic can be found here. It is linked from the Transcript section.
- 1190: Time/Translator - All the blurry text from the translator, both with the original image and enhanced contrast.
- 1190: Time/Frame by Frame Breakdown - List of all the frames of the comic, in the order that they were revealed.
- 1190: Time/Pictures - Timelines of the walks along the river and

on to the mountains, combining the scenery, action, and dialogues into a smooth timeline.

#1191: The Past

March 27, 2013



If history has taught us anything, we can use that information to destroy it.

Explanation

"The past is a foreign country, they do things differently there" is the opening line of "The Go-Between", a novel by Leslie Poles Hartley (1895–1972), published in London in 1953. The phrase was intended to highlight the impact of changing social norms and customs. As when dealing with a foreign society, one must be prepared to encounter different ways of life than one is accustomed to. And that's true, even over a single lifetime, so in recalling one's past, it's important to understand the context in which those memories take place.

Black Hat, however, decides to take the first part of the quote literally, and consider "the past" as it it were an actual foreign country. In true Black Hat fashion, the first thing he considers is that this "nation" would have an outdated military (by definition, because current technology and military doctrine hadn't been invented) and huge oil reserves (because their reserves would not yet have been depleted). The implication of these two points is that such a country would be ripe for invasion by a more powerful nation, seeking to control their natural resources.

The pensive way in which he makes these points implies that he's genuinely considering trying to mount an invasion of "the past". Such an invasion would, of course, require inventing a time machine, and could introduce all sorts of potential issues with the space-time

continuum (depending on how the space-time continuum actually works). But time travel is hardly unknown in the XKCD universe, and Black Hat isn't the type to worry about consequences when there's an opportunity to gain some benefit.

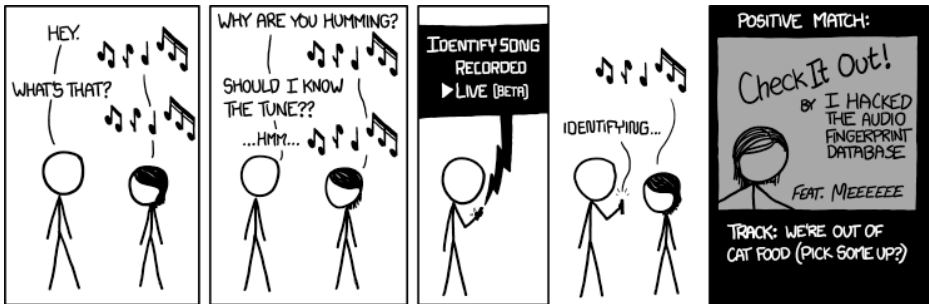
This notion has shown up in fiction before. For example, "Mozart in Mirrorshades" is a short story by Bruce Sterling and Lewis Shiner, which features the use of time travel to exploit earlier eras' natural resources. As another example (from the short story *Young Zaphod Plays It Safe*), "When the hunt for new sources of energy had at one point got particularly frantic, one bright young chap suddenly spotted that one place which had never used up all its available energy was - the past. And with the sudden rush of blood to the head that such insights tend to induce, he invented a way of mining it that very same night, and within a year huge tracts of the past were being drained of all their energy and simply wasting away. Those who claimed that the past should be left unspoilt were accused of indulging in an extremely expensive form of sentimentality."

The "If history has taught us anything" is usually used to introduce a lesson that the speaker takes to be clear and obvious from history. The title text of this strip subverts that by implying that lessons learned from history can count as military intelligence to use against it.

The concept of going back to the past to collect resources (or, at least, set up the collection of resources) shows up again in 2321: Low-Background Metal.

#1192: Humming

March 29, 2013



I'm so bad at carrying a tune, those 'find a song by humming its melody' websites throw an HTTP 406 error as soon as I start to hum.

Explanation

Services like MusicBrainz and SoundHound can detect a recorded song's acoustic fingerprint and match it with an existing song. This lets them identify the title and artist of an unnamed recorded musical extract. In this comic, Megan hacks the acoustic fingerprint database to add her own entry with a message to Cueball, in which she asks him to buy cat food.

Megan would use this app again in 1199: Silence.

HTTP error code 406 means Not Acceptable. When a client requests data from a server, the client lists the data formats that it can accept. If a server is unable to provide data in any format that the client accepts, the server returns error 406 Not Acceptable. For example, this can occur if a client requests XML but the server supports only JSON. In the title text, the standard meaning of the error message is ignored and the text "Not Acceptable" is taken literally: The server is offended by Randall's humming.

#1193: Externalities

April 01, 2013

Explanation

This was the fourth April fools' comic released by Randall. This comic isn't a static image - even the title text changes depending on which part of the image you're hovering over. It presented a competition for students to see who could come closest to breaking a Skein hash but also an aid appeal for the Wikimedia Foundation.

The comic references multiple times Baidu, a large Chinese Internet services company. Baidu controls the predominant Internet search provider of China and is sometimes called the "Google of China" for the similar services it provides. Baidu Search results follow the censorship dictates of the Chinese authorities, causing it to return censored responses to searches for politically sensitive terms when executed by web browsers in China. Thus, Megan replies "But nothing about Tiananmen Square." in the first panel is a reference to the 1989 Tiananmen Square protests and massacre that killed hundreds of civilians. "It takes great minds to stifle other great minds." and "Let's block Canada" in the second panel are also references to the arbitrary government censorship of Baidu and other Chinese companies.

The blank regions in the above image are dynamically generated from various sources.

- The university that is being recruited changes depending on which university is winning the hash

finding competition in the fifth panel.

- The company doing the recruiting is randomly selected from a pool of companies. It was formerly the first NASDAQ-100 company mentioned on a varying Wikipedia page.
- The text in the second panel may vary: See this section.
- The text in the third panel may vary: See this section.
- The text in the fourth panel may vary: See this section.
- The text in the fifth panel changes, depending on which university is currently in third place in a hash finding competition. Clicking on the panel takes you to a webpage where people can enter their school's domain name and hash data, and ranks schools on how close their students can come to matching a Skein 1024 1024 hash value.
- The text in the top half of the sixth panel may vary. See this section. The second half of the panel is always the same.
- The last panel varies with the amount donated to the Wikimedia Foundation via this link. For past images, see this section.

Hashing Competition[edit]

For the two days until comic 1194 appeared, a competition was underway to see who could come closest to breaking a Skein hash. The first text line of the first panel contains a link to <http://almamater.xkcd.com>. This page contained the text:

On this page, users were invited to enter "Your school's domain name" — presumably intended to be their college alma mater. (At

least in the beginning, only a few top-level domains were accepted.) If the user entered an acceptable domain (by xkcd's rules, which apparently changed during the 48 hours of the competition), they could then enter data values one at a time. For each data value entered, xkcd returned a hash value and the number of bits by which it differed from the target value. The object was to achieve the lowest possible number of differing bits, ideally zero.

A ranking page showed the lowest value achieved for each domain name entered, but not the data that achieved it. The first name on the list was substituted in various panels, and the third-place school showed in panel five. No data values were reported by xkcd, but various results were posted by users of the xkcd forums and on other websites, leading to copycat submissions, so that occasionally large numbers of institutions would show the same moderately low value.

After the end of the contest, the data submission page vanished, replaced by the final list of rankings, which shows that Carnegie Mellon University achieved the best score with 384 bits incorrect out of 1024. The rankings only show a few hundred out of the several thousand domains submitted—presumably Randall chose to chop the copycat submissions off the end of the list, retaining only honestly obtained results.

First Panel[edit]

In some cases, Megan's reply seems to correspond to the company.

Second Panel[edit]

The text in the second panel is based on the company in the first panel:

Third Panel[edit]

Fourth Panel[edit]

Fifth Panel[edit]

The text in the form varies independently of the text at the top, sometimes related to the organization in 3rd place:

Sixth Panel[edit]

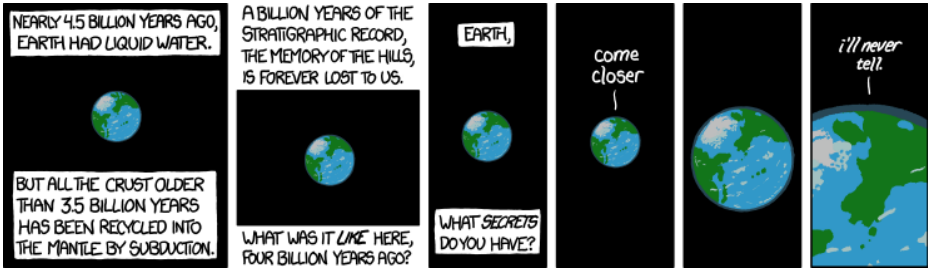
Seventh Panel[edit]

Title Text[edit]

The title text documents the different sources of data in the comic. The different title texts are:

#1194: Stratigraphic Record

April 03, 2013



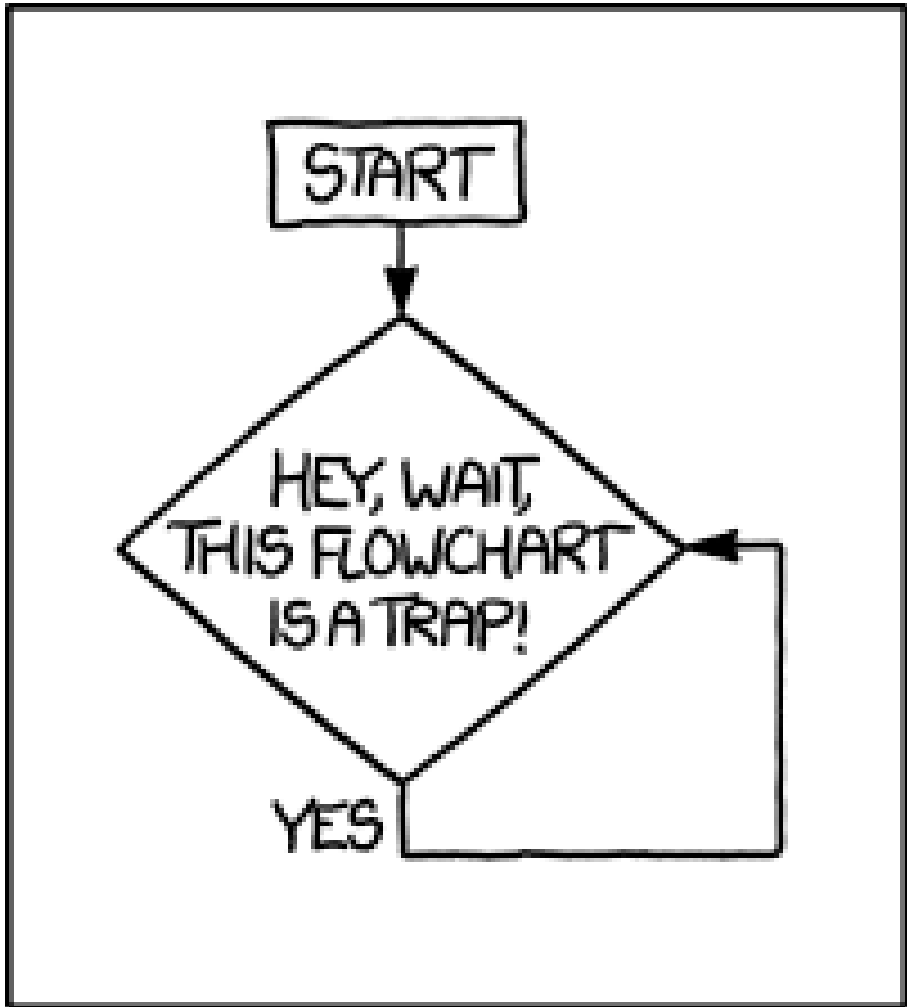
All we have are these stupid tantalizing zircons and the scars on the face of the Moon.

Explanation

We have no rock formations on Earth older than about 3.5 billion years, as the comic points out, because everything solid from before that time has been subducted down into the Earth's mantle, by tectonic movement. The title text hints at the cooler Moon which stopped re-melting its surface much sooner, so we theoretically could learn something about Earth's history from examining our Moon's surface and makeup. Zircons are a type of mineral found in the Earth's crust, some of which have been estimated to be as old as 4.4 billion years, older than any other mineral.

#1195: Flowchart

April 05, 2013



The way out is to use the marker you have to add a box that says 'get a marker' to the line between you and 'start', then add a 'no' line from the trap box to 'end'.

Explanation

Flowcharts are diagrams used to show the logical flow of an algorithm, process, or program. Flowcharts are a recurring theme in xkcd. In this comic, Randall uses the fact that flowcharts can indeed be used to show a loop in the procedure: in this case, the reader will theoretically become trapped in a loop of reading the text in the diamond, following the line marked "YES," and ending back up in the diamond. Those familiar with flowcharts will notice though that, while diamonds usually contain decision questions (which can be answered multiple ways), the diamond here actually includes a statement instead.

The title text contains a suggested solution to the loop: the way to escape the loop is to use a marker and add an additional "NO" arrow proceeding from the diamond to a rounded box labelled "END" before you start the algorithm at "START." This suggests that the decision question in the diamond could more properly be phrased as "Is this flowchart a trap?" However, to follow this suggestion, you would need to actually have the marker that you are about to write instructions to go get. Thus, you must also add the instruction "get a marker" somewhere before the flowchart actually begins (before "START"), so that you actually have the marker by the time you get to the flowchart in the comic. And since you did not have a marker and could thus not write this way out, you are still trapped!

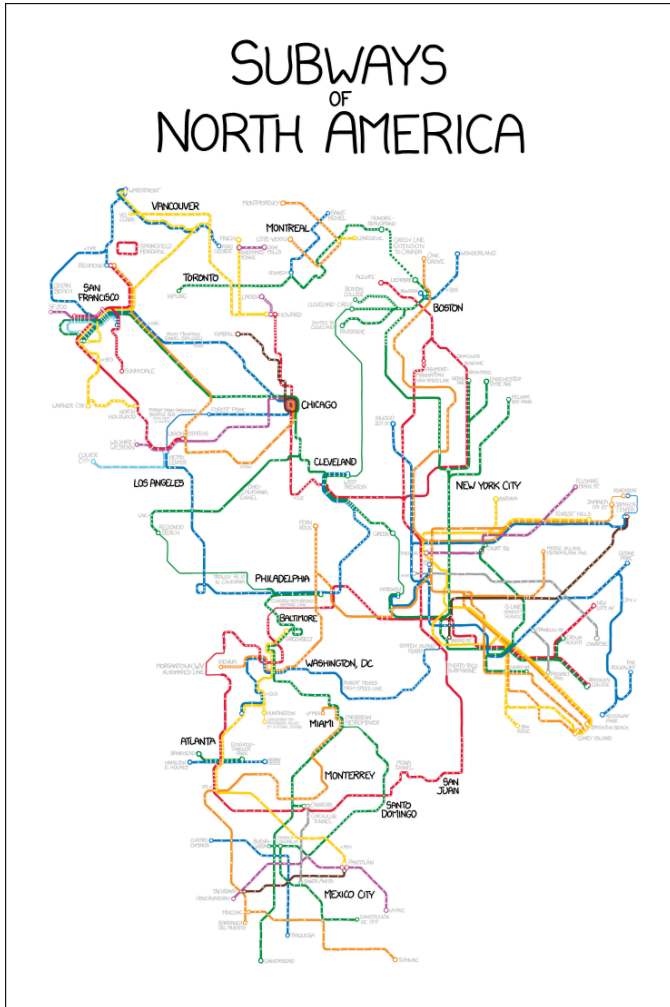
Of course, the reader could disregard the algorithm, but this would break the conventions of following the flowchart. This is perhaps part the comic's purpose - to suggest that a problem cannot be solved from within the confines of its own conventions.

Randall has made use of flowcharts before, and previously released another comic named 518: Flow Charts.

#1196: Subways

April 08, 2013

SUBWAYS OF NORTH AMERICA



About one in three North American subway stops are in NYC.

Explanation

The comic shows the maps of all North American subway networks. In reality, none of these systems are interconnected, but in the diagram subways from different cities that have the same color on the official subway map have whimsically named connections, such as the "Ohio-California Tunnel" connecting the Green Lines of Cleveland and Los Angeles, or the "Rocky Mountain Tunnel" connecting the Blue Lines of Chicago and San Francisco. Vancouver and San Francisco are connected through a station called Richmond, which appears to double as Richmond, British Columbia and Richmond, California. The "Springfield Monorail" is fictional, from the animated series *The Simpsons* (see *Marge vs. the Monorail*), but its approximate location on this map would suggest the Seattle Monorail, or perhaps Springfield, Oregon, which Matt Groening revealed was the inspiration for the *Simpsons'* hometown.

The Urban Mass Transit Systems of North America map (right) created by Yale Professor Bill Rankin on his website *Radical Cartography* in 2006 presents all of the subway systems in North America at the same scale using geographic, instead of topological, layout. The networks on *xkcd's* map are displayed with absolutely no consideration to geographic position, in order to connect like-colored routes together. While Vancouver is the most North-West, Mexico City being the most South, and San Francisco the most west, distances are not

accurate (in reality, Vancouver is closer to Chicago than to Toronto for example) and cities are often arranged in the wrong direction from one another:

- San Francisco is shown directly west of Toronto - in reality west southwest
- Boston is shown directly north of New York City and just slightly to the west - in reality east northeast
- Atlanta is shown west southwest of Miami - it is actually north northwest
- Atlanta is shown northwest of Mexico City - it is actually northeast
- Atlanta is shown slightly east of being south of Los Angeles - it is actually just slightly north of being directly east

The map's design is modeled after the system map of the Massachusetts Bay Transportation Authority in Boston where Randall is from.

City-specific notes[edit]

- The Canada Line and the Expo Line are shown as the same color; SkyTrain's official maps depict them with light blue and dark blue respectively.
- Richmond, B.C., is the name of the city where the southernmost terminus of the Canada Line is located, and shares its name with Richmond, California (see San Francisco section).
- The "Green Line Extension to Canada" references the actual project to extend the Green Line into Medford, north of

Boston, which was completed in 2022.

- The "Ashmont–Manhattan High-Speed Line" shown as connecting Boston's Red Line to New York City's 1 train is a play on the Ashmont-Mattapan High Speed Line in Boston.
- The renamed Red Line stops Skinflower and Bonevine are plays on the actual name of the Red Line's terminus, Braintree.
- The Orange Line terminates at Forest Hills in Jamaica Plain. It is connected to New York's IND Concourse Line, but unfortunately despite its ambiguous appearance on the map this does not actually through-run to the IND Queens Boulevard Line with its Forest Hills and Jamaica stations.
- Both Muni and BART are depicted in San Francisco's map and are completely separate systems, although the map gives the impression that trains interline between the two. Non-wheelchair-accessible stops on Muni lines are omitted.
- Richmond is the name of the city where the northern terminus of the Richmond–Fremont and the Richmond–Daly City/Millbrae BART lines are located, and shares its name with Richmond, British Columbia (see Vancouver section).
- "Sunnydale" is the actual name of the terminus of the Muni T Third Street line, not to be confused with the city where Buffy the Vampire Slayer is set, nor the very real city of Sunnyvale, located approximately at the location shown, some 40 miles Southeast of San Francisco.
- The Gold Line and the Orange Line are shown with swapped colors.
- The Orange Line is the only bus rapid transit (BRT) line to be shown on the map. LA Metro also operates a second BRT line, the Silver Line, which is not shown.

- The New York City Subway, Port Authority Trans-Hudson (PATH), and the single line of the Staten Island Railway (with a connection via the Staten Island Ferry) are shown.
- Jamaica is the name of the neighborhood in Queens where the E, F, and J/Z trains terminate. Kingston is the capital and largest city in the country of Jamaica.
- The actual G train is notorious for unreliable service, hence the "Random Service" notation.
- The "Robert Moses High-Speed Line" refers to the NYC urban planner Robert Moses, who was one of the most influential planners in supporting cars over all public transport, creating the car-dependent New York metropolitan area.
- Both SEPTA subway lines, a portion of the SEPTA Subway–Surface Trolley Lines, and the PATCO Speedline are shown.
- "Trolley Rt. 10 to California" is a play on the actual Route 10 trolley.
- The "Graveyard for passengers killed by closing doors" refers to the warning played in the Washington DC Metro system advising passengers that the subway doors are "not like elevator doors" and will close on your limbs or belongings rather than opening when contact with an object is detected.
- The "Morgantown, WV Automated Line" references the Morgantown Personal Rapid Transit system, which was built in 1975 as a personal rapid transit demonstrator and serves the three campuses of West Virginia University.
- Greenbelt is the northern terminus of the Washington Metro's Green and Yellow lines, hence the Green line being depicted as forming a belt.

- This comic was made before the Silver line was constructed, so it does not appear in the comic.
- The "Caribbean Metromover" references the Miami Metromover, a people mover in downtown Miami (not shown on the map.)
- The airport logo for Miami International Airport (MIA) is replaced with a paper airplane.
- The "Puerto Rico Submarine" that connects the Red Lines of San Juan and New York refers to the fact that San Juan is on an island, namely Puerto Rico.
- The "Mona Tunnel" that connects the Red Lines of San Juan and Santo Domingo may refer to the island of Mona, which lies between Puerto Rico and Hispaniola.
- The "Chicxulub Tunnel" that connects the Red Lines of Santo Domingo and Monterey refers to the 65-million-year-old Chicxulub crater, which lies roughly between the two cities.

Official subway maps[edit]

- Atlanta - <http://www.itsmarta.com/rail-schedules-or-route.aspx>
- Baltimore (MTA Maryland) - <http://mta.maryland.gov/sites/default/files/metro-subway.jpg>
- Boston (MBTA) - http://www.mbta.com/schedules_and_maps/subway/
- Chicago (CTA) - http://www.transitchicago.com/assets/1/maps/P19_2012_CTA_Rail_Map.pdf
- Cleveland - http://www.riderta.com/pdf/maps/System_Map_Rapid_Connect.pdf

- Los Angeles (LACMTA) -
http://www.metro.net/riding_metro/maps/images/rail_map.gif
- Mexico City -
<http://www.metro.df.gob.mx/imagenes/red/redinternet.pdf>
- Montreal -
<http://www.stm.info/english/metro/images/plan-metro.jpg>
- New York City (MTA) -
<http://www.mta.info/maps/submap.html>
- New York City (PATH) -
<http://www.panynj.gov/path/maps.html>
- Philadelphia (SEPTA and PATCO) -
<http://www.septa.org/maps/system/index.html>
- San Francisco (BART) -
<http://www.bart.gov/images/global/system-map.gif>
- San Francisco (MUNI) -
<https://www.sfmta.com/maps/muni-metro-map>
- Toronto (TTC) -
<https://www.tourbytransit.com/toronto/public-transit/subway>
- Vancouver -
<http://mapa-metro.com/mapas/Vancouver/mapa-metro-vancouver.png>
- Washington (WMATA) -
<http://wmata.com/rail/maps/map.cfm>

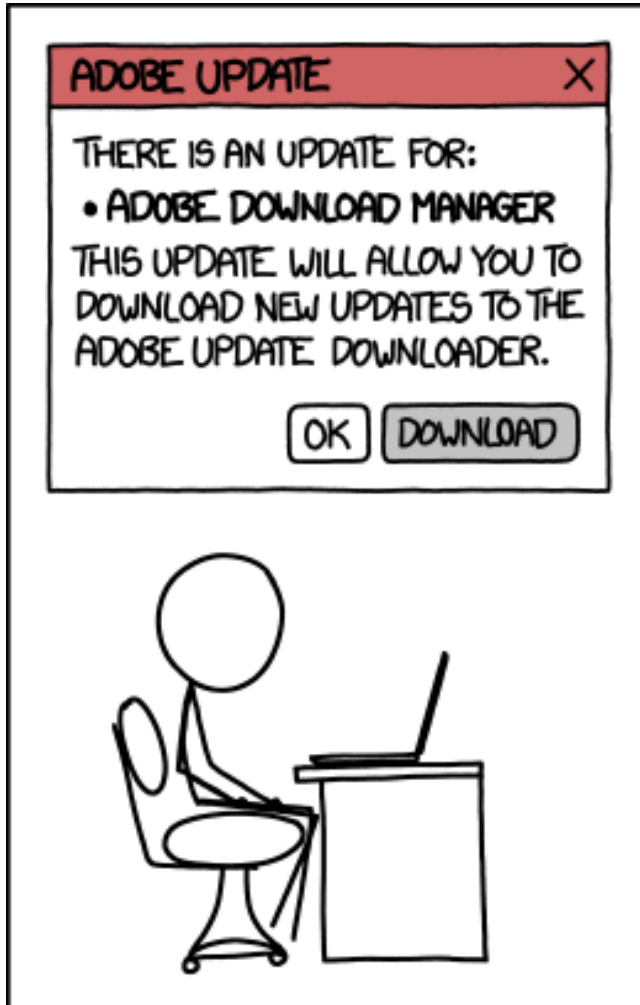
Missing cities[edit]

Not all cities with a subway are shown on the map. Missing from the map:

- Pittsburgh (Port Authority of Allegheny County) has a light rail subway tunnel, called The T, in the downtown area. The subway opened in 1985, which is before this comic was published.[citation needed]
- Seattle (Sound Transit) has a light rail called the link light rail has multiple underground tunnels as well as above ground stop. Opened in 2003, there are 3 seperate lines, serving Lynwood, Seattle, and Seattle–Tacoma International Airport on the 1 line, King County Eastside on the 2 line, and Downtown Tacoma and the Tacoma Dome on the T line.

#1197: All Adobe Updates

April 10, 2013



ALERT: Some pending mandatory software updates require version 211.2 of the Oracle/Sun Java(tm) JDK(tm) Update Manager Runtime Environment Meta-Updater, which is not available for your platform.

Explanation

This comic was probably a reaction to the installation service Ninite removing Adobe Flash Player from their free version the previous day.

The comic makes fun of Adobe Systems software that delivers new versions of Adobe products to users' computers, such as Adobe Updater (which replaced Adobe Update Manager) and Adobe Download Manager (which replaced Akamai). These software increments might either be technical (to fix compatibility or security issues), or they might add new features that would go unnoticed. In addition, these updates are downloaded automatically by default, but the operating system might install them only if a user allows it to. The frequency of software changes (and changes in the way Adobe allows users to download new software) could result in confused users. In this case, the comic is saying that you must update the program before it can actually check for updates, something it already seems to be doing.

There is an actual message that a specific version of these updaters display:

In fact, the general necessity of such update managers has often been questioned, as they require the user to "download software in order to download other software". Other notable examples of companies who use update managers include Google and Sun/Oracle, with

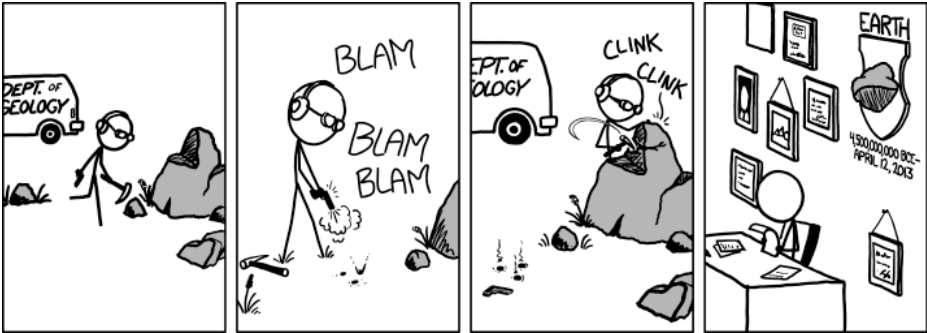
the latter being also mentioned in the title text.

The two buttons 'OK' and 'Download' are implied to have the same effect, indicating the user has no real choice. Or, alternatively, 'OK' may simply just close the dialog without taking any action, as that is common in informational popups in many pieces of software. In that case, the placement of the 'OK' button implies that it is the default action, meaning most users will just ignore the update. Given the extreme frequency and perceived lack of changes (to your average end user), this anecdotally seems to be what most people do. Statistics for the high rate of un-patched systems in the wild support the anecdotal evidence.

The title text also suggests that using update helper software which in turn must be updated bears the risk of creating a dependency hell.

#1198: Geologist

April 12, 2013



'It seems like it's still alive, Professor.' 'Yeah, a big one like this can keep running around for a few billion years after you remove the head.'

Explanation

Geology is the study of the physical and chemical makeup of the Earth and geologists are sometimes called rock hunters, sometimes derisively.

Hunters, after killing an especially difficult or rare beast, sometimes remove its head and hang it up on a wall as a trophy. Cueball, as a geologist, "kills the Earth" by shooting at it. He removes its "head," a chunk of rock, and hangs it up on his office wall. Above the trophy it says Earth, and below it gives it lifespan from 4,500,000,000 BCE (Before Common Era), which is the current age of the Earth, and then until the day where he shot Earth, which is also the day this comic was released: 2013-04-12. The topic of hunting things that are not usually hunted is also in 640: Tornado Hunter

The title text is probably a reference to a chicken running around with its head cut off. A few billion years (7,600,000,000 years) is also about how much longer the Earth is expected to last, assuming it gets swallowed up by the expanding Sun at the end of the Sun's life.

#1199: Silence

April 15, 2013



All music is just performances of 4'33" in studios where another band happened to be playing at the time.

Explanation

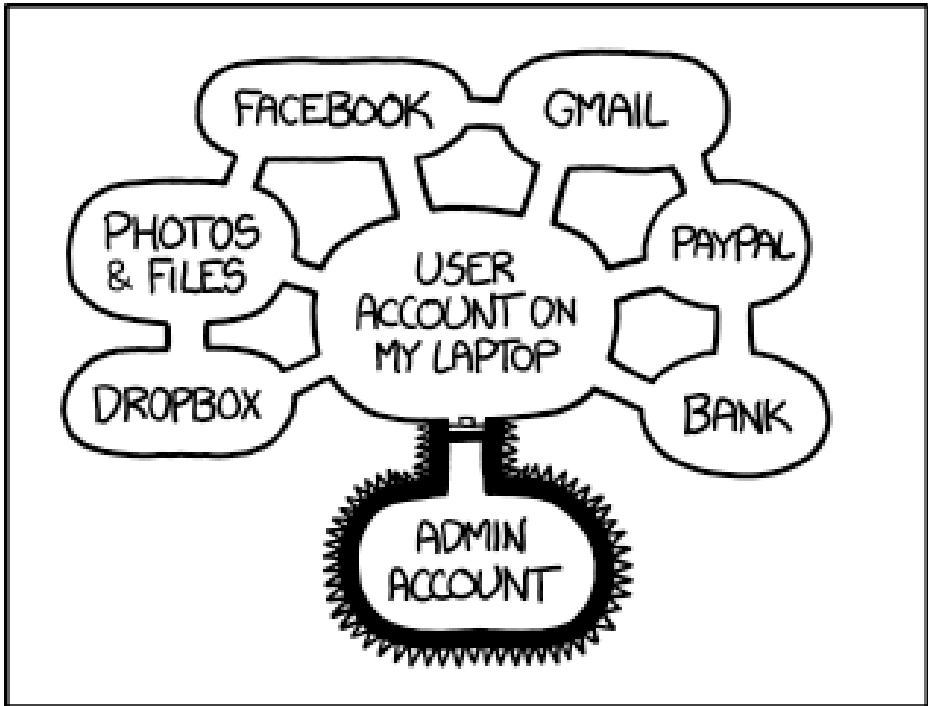
4'33" is a 1952 composition by American avant-garde composer John Cage consisting of four minutes and thirty-three seconds of silence. More specifically, 4'33" consists entirely of faint ambient sounds coming from the environment, while all the players silently hold their instruments. The noise of the audience is considered part of the composition. It is Cage's most famous work, and the subject of many music jokes. Note that John Cage wrote plenty of other non-silent things.

Megan is using an app on her smartphone that analyzes music that is playing and uses an online database to figure out what it is; popular real-world examples include Shazam and SoundHound. She does this in an empty room, correctly matching 4'33". Cueball attempted to use the same app in 1192: Humming, but Megan hacked it there.

The title text refers to the fact that since 4'33" is composed of the ambient sounds in an environment, if that environment is a recording studio, live music venue etc. the ambient sound is a band playing another song.

#1200: Authorization

April 17, 2013



IF SOMEONE STEALS MY LAPTOP WHILE I'M
LOGGED IN, THEY CAN READ MY EMAIL, TAKE MY
MONEY, AND IMPERSONATE ME TO MY FRIENDS,
BUT AT LEAST THEY CAN'T INSTALL
DRIVERS WITHOUT MY PERMISSION.

Before you say anything, no, I know not to leave my computer sitting out logged in to all my accounts. I have it set up so after a few minutes of inactivity it automatically switches to my brother's.

Explanation

Certain computer operating systems were initially designed as multi-user systems. As the name suggests, these systems are meant to be used by multiple people or users, sometimes at the same time. To prevent malicious or accidental destructive damage to the system, users are split into two general groups: regular users, and system administrators (or admins). Regular users can access and use programs on the computer, but only the admin is allowed to make changes to how the computer runs. This same split level of security continues to this day, even in privately owned, or "home", computers.

The wry remark made here is that in the decades since the most important things on a computer to be worried about are no longer the programs that it runs, but the private personal data it contains and can access (usually online). Anyone who wished to do real mischief on an active computer could do considerable damage without ever caring what the admin password was. The admin password, in effect, now protects something that has become barely, if any, concern.

This comic pokes fun at the authorization mechanisms surrounding most operating systems' administrator accounts. It makes the argument that the user's data is more valuable than the integrity of the system. This is arguably true for most personal systems, although it is probably not true in a shared-server setup, where a system compromise could lead to the exposure of many

users' data.

Essentially, once a user is logged in, they can typically access all of their data without any further restriction. Modifying the operating system (for example, to install drivers) requires a separate password.

In fact, this password protection also hinders installation of malware, which is otherwise possible even remotely, with the malware then being able to e.g. steal passwords, enabling a cracker anywhere in the world to access your accounts without ever needing to touch your computer. So having your computer set up to not to ask you for an administrator's password arguably implies a bigger risk of identity theft than allowing others to access your system physically while being logged in does.

The title text alludes to the security practice where computers automatically lock the user out after a few minutes, requiring a password from the user in order to continue using it. Instead, Randall's computer automatically switches to his brother's account, presumably compromising his data instead of Randall's. The fact that Randall's brother has an account on Randall's computer even though Randall does not live with his childhood family (so his brother would not need to use his computer often) could be because Randall does not want his brother to be able to access his files, PayPal, etc... when he uses his computer, which would indicate that either Randall is cynical, his brother is not trustworthy, or Randall is simply following the principle of least privilege.

#1201: Integration by Parts

April 19, 2013

A GUIDE TO INTEGRATION BY PARTS:

GIVEN A PROBLEM OF THE FORM:

$$\int f(x) g(x) dx = ?$$

CHOOSE VARIABLES u AND v SUCH THAT:

$$u = f(x)$$

$$dv = g(x) dx$$

NOW THE ORIGINAL EXPRESSION BECOMES:

$$\int u dv = ?$$

WHICH DEFINITELY LOOKS EASIER.

ANYWAY, I GOTTA RUN.

BUT GOOD LUCK!

If you can manage to choose u and v such that $u = v = x$, then the answer is just $(1/2)x^2$, which is easy to remember. Oh, and add a '+C' or you'll get yelled at.

Explanation

Integration by parts is an integration strategy that is used to evaluate difficult integrals by trying to find simpler integrals derived from the original. It is commonly a source of confusion or irritation for students when they first learn it, due to the fact that there is really no way to accurately predict the proper u/dv separation just by looking at an integral. Integration by parts requires patience, trial and error, and experience.

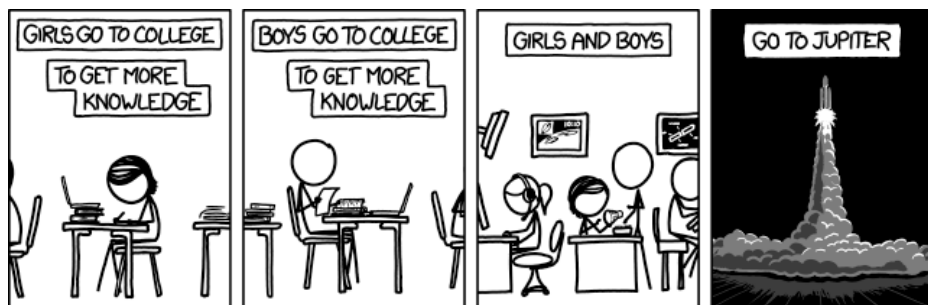
Randall shows a somewhat complicated math problem and, in an attempt to "help", simplifies it into a more compact integral. This is the first part of performing integration by parts, which involves the guessing. Having gotten it into integration by parts format, he then leaves without describing the actual solution. The general integral $\int(u \, dv)$ is equal to $uv - \int(v \, du)$, and this is the more tedious part of the math and where problems will arise if you picked the wrong u and dv at the beginning. The narrator makes a point of leaving here, so we can't ask for help or complain if the choice of u and dv was wrong.

The title text points out that if the integral of x can be divided so that $u = x$ and $dv = dx$ and implying $v = x$, then it leads to the result $(1/2)x^2$. This implies the original integral was just $\int x \, dx$, and not needing integration by parts in the first place. Mathematics teachers and extreme math geeks will also cringe at this answer, however, since an indefinite integral requires an

integration constant. The correct answer is actually $(1/2)x^2 + C$, as Randall hints. The $+C$ symbolizes that an indefinite integral can be shifted by any constant and still gets the same answer on the reverse derivative. Definite integrals specify a range that they're valid on and thus there is no need to add this constant.

#1202: Girls and Boys

April 22, 2013



To get more knowledge

Explanation

This comic and 2771: College Knowledge are plays on the popular school-yard taunt, "Girls go to college, to get more knowledge; boys go to Jupiter, to get more stupider," also commonly heard as "Boys go to Mars, to get more candy bars; girls go to Jupiter, to get more stupider." The words "boys" and "girls" may be interchanged, depending on the gender of the person chanting (or how intelligent they are, for that matter). The schoolyard taunt embodies the competitiveness and separation commonly seen between young boys and girls, and ideas about the superiority of one's gender.

It should be noted that, historically, most higher education was preferentially or exclusively reserved for men, but that changed rapidly over the course of the 20th century. By the late 1970s more women than men were enrolling in college, and that trend has only increased, to the point where women make up nearly 60% of undergraduate students in American colleges and universities. This is an issue of substantial concern, because it reflects national trends in men failing to achieve academically. This comic may be pointing out that this gendered competition, which is often inculcated from an early age, is counter-productive, because it focuses on one gender succeeding at the expense of the other. In truth, human achievement is maximized when both men and women are given opportunities to gain skills and succeed.

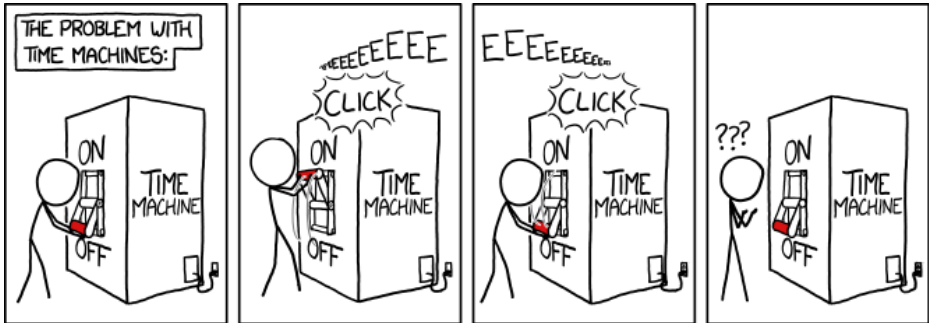
The comic subverts the original rhyme by having both girls (Megan) and boys (Cueball) go to college to gain knowledge, and then using that knowledge to go to Jupiter as part of a space program, working in cooperation with other men (another Cueball-like guy) and women (Ponytail).

Going "to Jupiter, to get more stupider" is ironic considering that human beings have not yet even gone to Mars, so to go to Jupiter would take a huge amount of knowledge, investment, and further development of current technology. Likewise, people in space programs going to Jupiter would have advanced degrees, a great deal of knowledge, and a motivation to seek out more knowledge. Space programs and going to Jupiter would require the cooperation of many different people, men and women included, and probably even different countries, rather than the divisive atmosphere of the schoolyard.

The title text points out that by going to Jupiter you would get more knowledge, which is generally the purpose of any space program; that is, the purpose is to advance science, and it wouldn't actually be dumb at all. Therefore, the task of going to Jupiter is absolutely dependent on going to college, cooperation, and getting more knowledge; entirely the opposite of what the schoolyard taunt suggests.

#1203: Time Machines

April 24, 2013



'All time machine systems nominal ... T-minus ten ... eleven ...'

Explanation

Cueball activates a time machine to go back into the past. The time machine rewinds time, but in the process rewinds the event where the time machine itself was turned on, turning the time machine off in the process. He is now a few seconds in the past, prior to having activated the time machine, but he is baffled that he does not seem to have accomplished anything and turned off the time machine unintentionally. It would seem that the time machine is the world's most technologically-advanced[citation needed] "useless machine" (a device whose only purpose is to switch itself off when it is switched on).

The title text mimics a countdown to an event. "T minus 10," for example, means 10 seconds until the event. When the event is the activation of a time machine traveling back in time, after 10 seconds it will once again be "T minus 10," and a second later it will be "T minus 11," counting up rather than down. This casts doubt on the value of the countdown because, from the perspective of the time traveler, the event has already taken place.

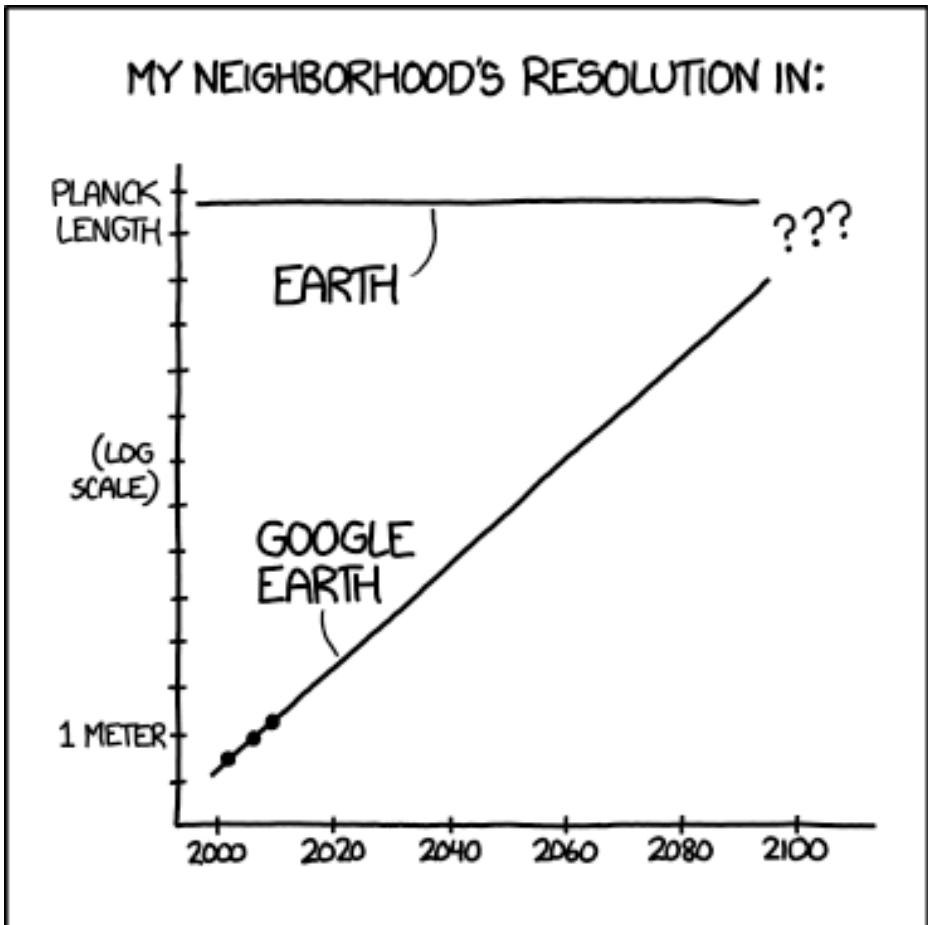
Cueball is only able to travel back in time a few seconds because in this comic time is seen as continuous and linear from Cueball's point of view, so he can only travel back in time to the moment he activated the machine (the first series of "E"s is the machine warming up and the second series of "E"s is that in reverse) the logic behind

this is that because time appears to be continuous, Cueball's input was required for the machine to work. Since it does not appear to be a traveling vessel, it is also possible that Cueball could trap himself in the past by traveling to a time before the machine was created, and it would remain in the present.

It is very fortunate that Cueball retains knowledge of the time travel process, brief as it was; if he didn't, then the universe would become trapped in a time loop, with Cueball flipping the machine on, which then reverts time back to before it was turned on, leading Cueball to (believing that he has not yet turned on the machine) immediately reactivate it, dooming the universe to repeat the same few seconds indefinitely.

#1204: Detail

April 26, 2013



2031: Google defends the swiveling roof-mounted scanning electron microscopes on its Street View cars, saying they 'don't reveal anything that couldn't be seen by any pedestrian scanning your house with an electron microscope.'

Explanation

In quantum mechanics, the Planck length is (in layman's terms) the smallest measurable distance, defined as approximately 1.6×10^{-35} meters, or around 1020 times smaller than the diameter of a proton. As the graph indicates, this may be called the "resolution" of the universe. Randall extrapolates the exponential trend of Google Earth's increasing resolution, 'revealing' that by the year 2120 or so, Google Earth's resolution will approach and even possibly exceed the Planck length, an obviously fanciful and impossible idea. Current laboratory instruments cannot even get close to measuring the Planck length, barely able to reach the level of the atom (which, by the chart's prediction, will be surpassed by Google Earth around 2040). Extrapolation and interpolation, often absurd, are recurrent topics on xkcd.




















The title text refers to controversy that Google received at one point regarding their use of vehicle-mounted Street View cameras to take images of streets and houses, and how such photography could constitute an invasion of privacy. Google defended itself by stating that the cameras can see nothing more than a pedestrian walking by. Given the trendline in this comic however, Google would need to produce resolution in the nanometer range by 2031, which (using today's technology) would require the use of scanning electron microscopes. The same 'invasion of privacy' defense would obviously not work here, as 1) current scanning electron microscopes in

labs can only be used with small specimens at very close range, and are completely unsuitable for observing something as large as a house or for observations from a passing car, and 2) most pedestrians are not equipped with scanning electron microscopes.[citation needed]

#1205: Is It Worth the Time?

April 29, 2013

HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?
(ACROSS FIVE YEARS)

		HOW OFTEN YOU DO THE TASK					
		50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
HOW MUCH TIME YOU SHAVE OFF	1 SECOND	 DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
	5 SECONDS	 DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
	30 SECONDS	 4 WEEKS	 3 DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
	1 MINUTE	 8 WEEKS	 6 DAYS	 1 DAY	4 HOURS	1 HOUR	5 MINUTES
	5 MINUTES	9 MONTHS	 4 WEEKS	 6 DAYS	21 HOURS	5 HOURS	25 MINUTES
	30 MINUTES		6 MONTHS	 5 WEEKS	 5 DAYS	 1 DAY	2 HOURS
	1 HOUR		10 MONTHS	2 MONTHS	 10 DAYS	 2 DAYS	5 HOURS
	6 HOURS				2 MONTHS	 2 WEEKS	 1 DAY
	 1 DAY					 8 WEEKS	 5 DAYS

Don't forget the time you spend finding the chart to look up what you save. And the time spent reading this reminder about the time spent. And the time trying to figure out if either of those actually make sense. Remember, every second counts toward your life total, including these right now.

Explanation

The comic is a chart showing the amount of work (time) one can dedicate to making a task more efficient, in order not to spend more time optimizing the task than the total time saved. This may illustrate the fact that computer scientists often try to optimize tasks they are likely to perform again in the future - a common goal in their work - even though the work needed for that optimization can itself prove much longer than the time saved when doing the task again; this was previously referenced in 974: The General Problem.

E.g. if you do some task every week once, and you are able to save 1 minute of time by doing some preparatory work (e.g. build or buy a tool), you can spend 4 hours doing this preparatory work, and you will, across five-years time, come even. Any less time spent doing the preparatory work, and you will profit from it.

The calculation on which the chart is based, for this example:

Therefore, 1 minute saved every week would, across five years, save over 4 hours of your time.

Or, in algebraic form:

The grayed out areas represent times which are either impossible to save, or where, if you could save this much (say 6 hours on one day), it would almost be worth it no matter how long it takes. For instance it is impossible to

shave 1 hour off a task if you perform it more than 24 times a day – the total time shaved off per day would amount to more than one day, and thus you could not have performed the task this many times in a day to begin with. On the other hand, 6 hours shaved off for one day is not impossible, but the net benefit would be so great, that it would very quickly earn itself back again almost no matter how long it takes. If the assumption is that a work day is 8 hours, then even if it took 2 years to do the improvement, you would already have earned it in after less than five years in total - both with the 2 years to make it and the time it takes to save 2 years (2.67 years in this case for a total of 4.67 years).

The comic assumes that equal amounts of time have equal value, which is not necessarily true. For an extreme example, consider programming a telephone with speed dials to be used when there is a fire or to call an ambulance or the police. This may take longer than the time saved when the call is placed, but it is worthwhile to spend a large amount of free time to save any time during an emergency.

Of course, all these conclusions presume you are the only one that benefits. If the savings can be easily adapted by others - for example, computer code for a program that automates a task for hundreds of people - then the amount of time that can be spent increases. Indeed, in some cases, when optimizing for others, spending far more time than they save can be worth it, if the people you're working for are paying you for the product and the time savings keep them happy and likely to keep

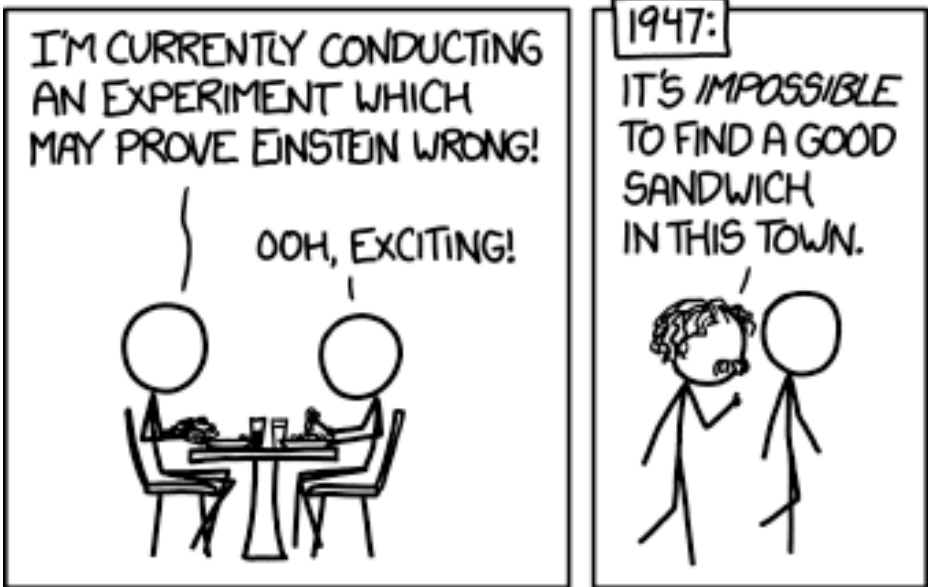
paying you. And if what you're optimizing is a business process that's unlikely to go out of date with your employer's current tools or its current products, then you may have more than 5 years to amortize the improvement.

The title text points out the time you spend studying this comic detracts from your overall efficiency, and concludes that maximizing efficiency would require optimal use of every second and finishes very philosophically by pointing out that every second you use counts towards your life total - also those you spend reading and/or editing a wiki about a web comic...

The comic derives humor from the absurd conclusions of hyper-efficiency, which have been examined in What if? - Cost of Pennies, and also in 951: Working which is devoted to insufficient economy, where the money saved is compared to the time wasted while looking for a bargain. In 1319: Automation Randall investigates how bad it really goes when you decide to automate a program to save you time... See also the Time management category.

#1206: Einstein

May 01, 2013



Einstein was **WRONG** when he said that provisional patent **#39561** represented a novel gravel-sorting technique and should be approved by the Patent Office.

Explanation

In this comic Randall is playing with the notion that since Einstein contributed so much to society, and many of his works have withstood testing, disproving Einstein must be a difficult task. This is proven false by taking a mundane declaration by Einstein and proving it false with a simple task.

Nobel laureate and Time Person of the Century Albert Einstein is often considered one of the smartest and most influential people in world history. His theories have revolutionized our understanding of the universe and inspired generations of scientists. In this comic, Cueball indicates to a friend that he is working on an experiment that may disprove Einstein. The implication is that Cueball is conducting a serious scientific experiment which may disprove one of Einstein's scientific theories. The second frame, however, implies that the Einsteinian "theory" Cueball's experiment may disprove is an offhand (and subjective) remark by Einstein about the availability of good sandwiches; this is not to mention the possible changing in quality of said sandwiches over time.

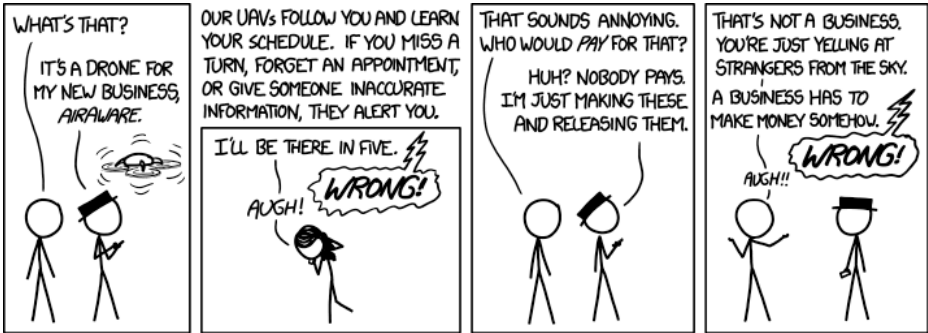
The experiment Cueball is "currently conducting" probably refers to the fact that he is currently eating a sandwich, and if that sandwich was indeed a good one, Einstein would be proved wrong. Part of the humor here is that Cueball's friend probably assumes that when Cueball says "currently," he means the experiment is part

of Cueball's work, not what he is doing at that exact moment. In 947: Investing, Randall comments on how people put too much credence in a joke Einstein made in passing, and in 799: Stephen Hawking we see Stephen Hawking in a similar predicament, every word he says taken as a major declaration.

The title text demonstrates the ability to "disprove" Einstein while not challenging his scientific work but rather one of his decisions in his capacity as a patent clerk at the Swiss Patent Office at the time he published his first major papers (previously alluded to in 1067: Pressures). According to the Einstein FAQ on the Swiss Federal Institute of Intellectual Property's website, patent #39561 is one of several patents that "we can assume ... were personally examined by Einstein". A PDF of the patent, which was indeed a gravel sorter (trommel), can be found here in German.

#1207: AirAware

May 03, 2013



It ships with a version of Google Now that alerts you when it's too late to leave for your appointments.

Explanation

Upon being asked by Cueball, Black Hat reveals his new 'business', AirAware. He explains it uses a Quadrotor Unmanned Aerial Vehicle (UAV) that flies and records a person's daily schedule. If that person either deviates, forgets an appointment, or tells somebody incorrect information, the drone alerts the 'client' with an annoying "WRONG!".

Cueball is skeptical of the 'business plan' and questions its potential. Black Hat expands, saying that his intention is not personal profit, and he is simply releasing them himself. Cueball starts to argue that it is not a business, since there is no monetary gain, before being abruptly interrupted by the AirAware drone, declaring that his previous sentence was incorrect. This implies that Black Hat's business is not for profit; it's just another one of his sadistic schemes to torture people, and Cueball is his latest victim.

Although the Wikipedia page for business states that a business "may also be not-for-profit", this isn't really relevant, as 'making money' and 'making a profit' are different things. It would be better classified as a different type of organization, or even as a hobby.

Google Now is software by Google, shipped with newer Android devices. It shows you important information when you need it, like traffic on your way to work or home and upcoming events from your calendar. It also

reminds you when to leave in order to reach an appointment in time. In the title text, Black Hat has modified this to tell you when you're too late to get there, instead.

It can also refer to a bug in Google Now, which is that Google Now incorrectly calculates the time you have to leave, and it always calculates that what it calculated will be 1 minute too late, so it shows "The transportation mode you selected will not let you arrive on time" almost always, unless you refresh.

An alternate explanation for the pronouncement of "WRONG!" by the quadcopter in the last panel is that it is referring to the plethora of companies in the electronic era, and even today, that don't actually make much (or any) money, but are still considered successful businesses.

#1208: Footnote Labyrinths

May 06, 2013

EXPERIMENTS TO OBSERVE THIS
AND WE FOUND NO¹² EVIDENCE
FOR IT IN OUR DATA.

¹ IGNORE THIS

² INCREMENT BY 2 BEFORE FOLLOWING

³ NOT TRUE³²

⁴ IBID.

⁵ TRUE²⁶³

⁶ ACTUALLY A 1²²

MY HOBBY: FOOTNOTE LABYRINTHS

Every time you read this mouseover, toggle between interpreting nested footnotes as footnotes on footnotes and interpreting them as exponents (minus one, modulo 6, plus 1).

Explanation

This is a logic puzzle where the reader has to follow a confusing network of footnotes to determine whether the word "no" is to be ignored or not.

In the following solutions, "right-associative" means that the footnotes are evaluated from right to left or top to bottom, and left-associative from left to right or bottom to top (e.g. $(26)3$ is left-associative, and $2(63)$ is right-associative).

The term "ibid." is short for "ibidem", or "at the same place", meaning the reference was noted on the same page just before.

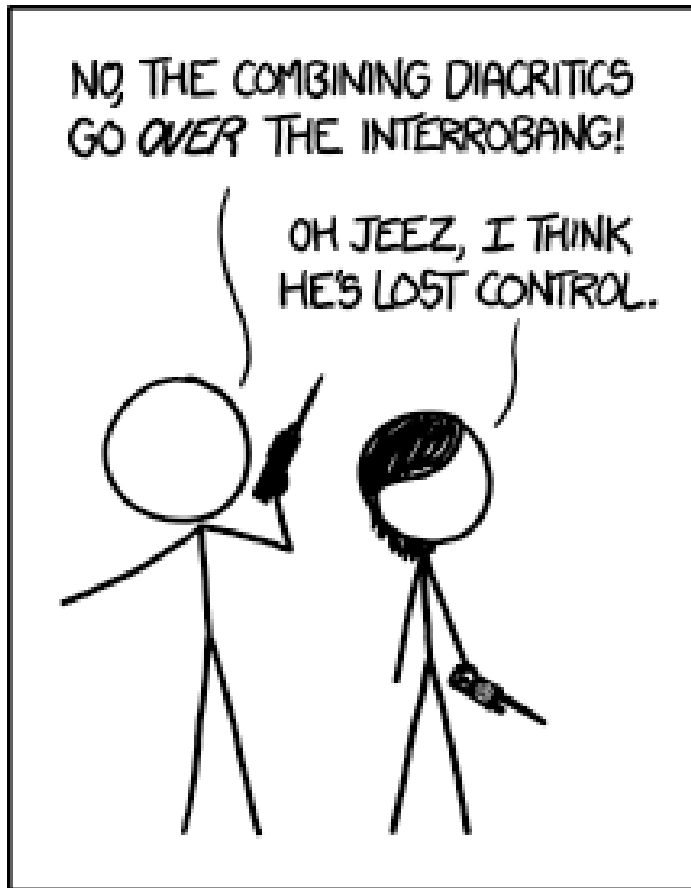
The title text suggests interpreting footnotes as exponents (minus one, modulo 6, plus 1). Because applying the operations "minus one, modulo 6, plus 1" to an integer always results in an integer between one and six (inclusive), no sequence of integer exponents will ever end up referencing a footnote that does not exist. In mathematics, nested exponents are exclusively right-associative. "no12" = "no1", so we ignore the "no" and the correct statement is "we found evidence for the data." Meanwhile, 3 becomes "not true3", an infinite recursion, and since $263 \bmod 6 = 4$, we just get "ibid" and the 5 refers back to the 3. Footnote 6 is equivalent to $14 = 1 = \text{"ignore this"}$.

The comic 1184: Circumference Formula also plays on

the typographical similarity between footnotes and exponents, as well as adding even more ridiculous rules.

#1209: Encoding

May 08, 2013



I don't see how; the CO block is right there at the beginning.

Explanation

Skywriting is using an airplane to write words in the sky with controlled releases of smoke. Unicode is a standard for digitally encoding text which supports a huge variety of characters and modifiers.

Cueball and Megan hired a skywriter to write some text which they provided in Unicode, but now they are dissatisfied with the result and Cueball is using one of their walkie-talkies to tell the pilot about his mistake—with the result that the pilot seems to lose control (presumably control of the plane, not the text).

An interrobang (!?) is a combination question mark and exclamation mark. A diacritic is any symbol added to a character (for instance ´, ˘, ˙, ¨), usually an accent mark added to a letter. In Unicode, combining diacritics are represented as separate characters, but computer programs that render text graphically treat them as modifications to the previous character. The request to modify the interrobang is strange, given that diacritics are supposed to modify letters, not punctuation marks, and given that an interrobang is already conceptually a character combination. On the other hand, combining diacritics can technically be used on any character, so the intended result will be something like:

!?

The skywriter's errors and the phrase "Unicode support"

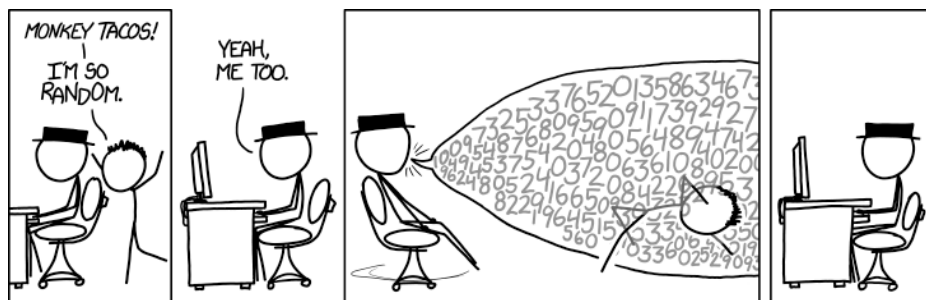
play off the common issue of software rendering Unicode symbols incorrectly. But here the error does not seem to make the text unintelligible: all the skywriter has apparently done is put a diacritic underneath (or perhaps next to) the interrobang instead of above it. If this is the only problem with the text (which is likely, given that an interrobang would probably be at the end), then the comment that the skywriter has "terrible Unicode support" makes Cueball and Megan seem fastidious and unforgiving. The comic points up computer users' tendency to use hyperbole when describing minor problems, exaggerating their relative seriousness. Here Cueball and Megan seem concerned more about their incorrectly rendered text than about the skywriter's safety.

The title text is presumably Cueball's reply, in which he appears to have misunderstood Megan: he is baffled as to how the pilot could have "lost" the Unicode control characters, which are the first 32 character codes (C0 codes) in Unicode, but Megan was actually referring to the pilot losing control of the plane.

1647: Diacritics also references an absurd use of diacritics.

#1210: I'm So Random

May 10, 2013



In retrospect, it's weird that as a kid I thought completely random outbursts made me seem interesting, given that from an information theory point of view, lexical white noise is just about the opposite of interesting by definition.

Explanation

A child Hairy walks up to Black Hat, utters a nonsense phrase ("monkey tacos"), and then proclaims that he is "so random". This is a fairly common modern phenomenon in which children (hopefully only children) make "random" statements, and somehow imagine themselves to be funny and interesting because of this. Black Hat, never one to hesitate over bringing someone down, replies that he is also random. He then proves this by pouring forth a torrential stream of truly random numbers that overcomes poor Hairy. Black Hat then resumes his posture at the computer, as if nothing has happened.

It is true that when brilliant and creative people speak passionately about a subject, they can make mental leaps and changes of context that might seem bewildering to an outsider. The conversation may even seem to be "random". However, simply vocalizing nonsense is not analogous, or even desirable; it is more likely a character trait of someone who is immature or has difficulty in following or adding to a normal human conversation.

Black Hat's "random" numbers are actually quoted from the first lines of A Million Random Digits with 100,000 Normal Deviates making it both "officially random", but also essentially not. This book is also referenced in 1751: Movie Folder. See also: 221: Random Number.

A side note is that "Monkey tacos" is a phrase that

contains two trochees. A trochee is a metric foot with one stressed beat and one unstressed beat; it may be a reference to or an unconscious allusion to 856: Trochee Fixation.

The title text deals with the connotations of the word "interesting" in different contexts. On one hand, children may be easily amused by behavior that lies outside of conventional social norms and defies expectations. Children may attempt to add whimsy to a situation they perceive as dull by interjecting words that have no significant meaning or relationship whatsoever to anything around them, merely to make things seem different and therefore "interesting" (at least to them.) There is some merit to this perspective: human social norms developed largely as a way to make social interaction more predictable and manageable and correspondingly less interesting, to free up our attention for other, more pressing matters. Someone who is indeed behaving "randomly" often does command interest and attention, if only because their unpredictability makes them potentially dangerous. However, to a child, social conventions may seem arbitrary and needlessly inhibitive, and they will often test the limits of such conventions by deliberately acting in violation of them and seeing what happens. "Random outbursts" of nonsense phrases are a fairly harmless way of doing this, and often do not incur sharply negative responses beyond annoyance (Hairy's experience being an exception), so children (including Randall in his youth) might do this very frequently until they mature out of it.

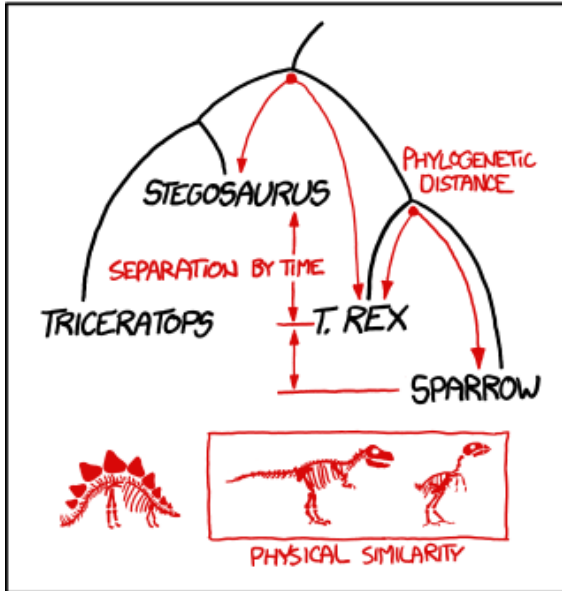
However, "interesting" in information theory is quite a different matter. Information theory is "the mathematical treatment of the concepts, parameters and rules governing the transmission of messages through communication systems." It is therefore very concerned with the meanings of the words and phrases people use to convey information, and it would regard something as "interesting" if it exhibited a notably consistent and predictable pattern that pointed towards greater significance. As such, "the opposite of interesting" would be expressions that hold no meaning, convey no information, and do not indicate any recognizable patterns or significance - such as the "random outbursts" that Randall once believed made him seem interesting as a child.

He characterizes these interjections of random words as "lexical white noise," "lexical" meaning "relating to words or vocabulary of a language." White noise is essentially random sound waves which, taken en masse, blend into audio static that takes on a macroscopically uniform sound experience despite their random nature. This can be used in some sleep or relaxation therapies, which foils well with the random assault experienced in the comic. There are also other colors of noise, and yes, people have strong opinions as to which one is better.[actual citation needed]

#1211: Birds and Dinosaurs

May 13, 2013

BY ANY REASONABLE DEFINITION, T. REX IS MORE CLOSELY RELATED TO SPARROWS THAN TO STEGOSAURUS.



BIRDS AREN'T DESCENDED FROM DINOSAURS,
THEY ARE DINOSAURS.

WHICH MEANS THE FASTEST ANIMAL ALIVE TODAY IS
A SMALL CARNIVOROUS DINOSAUR, *FALCO PEREGRINUS*.



IT PREYS MAINLY ON OTHER DINOSAURS, WHICH
IT STRIKES AND KILLS IN MIDAIR WITH ITS CLAWS.

THIS IS A GOOD WORLD.

Sure, T. rex is closer in height to Stegosaurus than a sparrow. But that doesn't tell you much; 'Dinosaur Comics' author Ryan North is closer in height to certain dinosaurs than to the average human.

Explanation

At the time the comic was released birds were commonly considered to be a separate class of tetrapods. However, this classification is false according to phylogenetic taxonomy. Taking into account that birds developed around 150 million years ago out of small theropod dinosaurs, birds along with crocodiles are indeed the remaining representatives of the archosaur clade. This premise appeared also in comic 867: Herpetology.

This relation between birds and dinosaurs is depicted in the comic in a cladogram which shows that *Tyrannosaurus rex* is more closely related to the common sparrow than to *Stegosaurus*. Not only do the former share a phylogenetic branch, but *T. rex* also lived around 80 million years after *Stegosaurus*. The concurrence of both species in popular culture is a widespread error. *T. rex* is also much more alike to modern birds than to other dinosaurs in terms of anatomy. This relationship was pointed out on the Science journal the week of the comic.

The comic draws the conclusion that if birds must in fact be considered modern dinosaurs, the hunting practice of birds of prey (specifically, the peregrine falcon) is consequently a dinosaur fight. For an inveterate dinosaur aficionado like Randall, this fact must make the modern world much more attractive.

The title text is a sidesweep to the webcomic *Dinosaur*

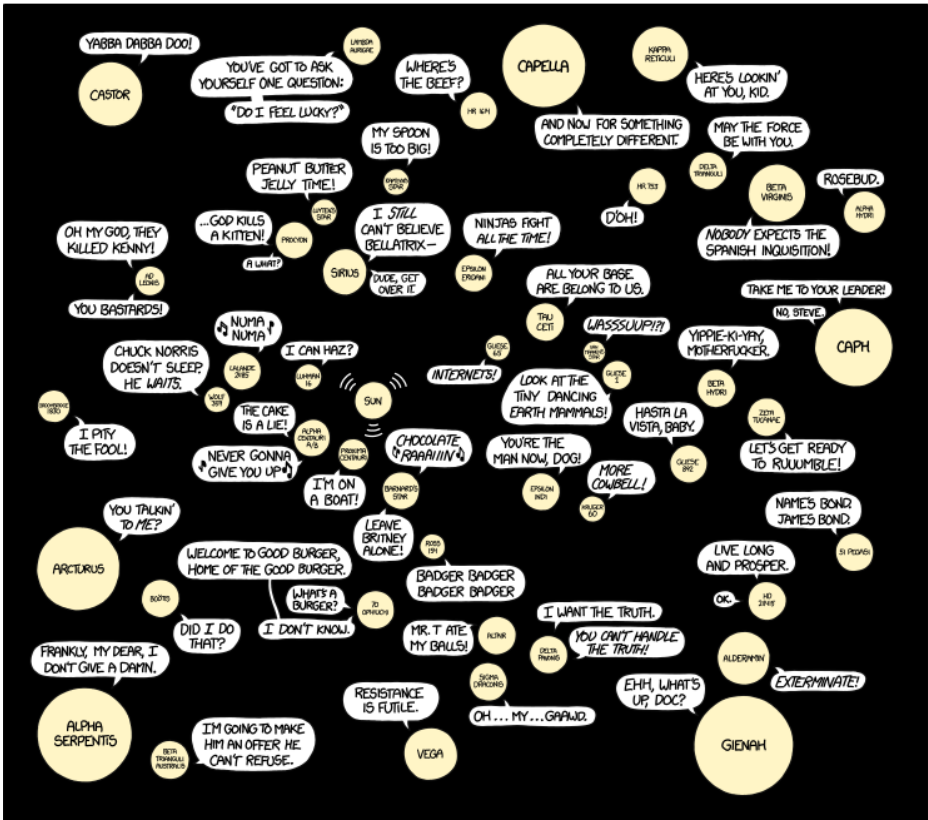
Comics drawn by Ryan North, who stands 6'6.5" (199 cm) tall. At that page the title text of the comic strip from the same day refers to Randall and xkcd.

The conclusion of this comic is referenced in the title text of the last image in the Plastic Dinosaurs What if?

#1212: Interstellar Memes

May 15, 2013

IF OTHER STAR SYSTEMS ARE LISTENING IN ON OUR POP CULTURE,
GIVEN THE SPEED-OF-LIGHT DELAY, THESE ARE THE JOKEs AND CATCHPHRASES
THEY JUST LEARNED ABOUT AND ARE CURRENTLY REPEATING WAY TOO MUCH:



The strongest incentive we have to develop faster-than-light travel is that it would let us apologize in advance.

Explanation

Our solar system, from where the electromagnetic waves are emitted, is located just left of the center of the picture. The other star systems are arranged roughly according to their distance from the sun, while their size corresponds to the size of the star compared with that of the Sun. The meme for Sirius is a pun; it refers to Harry Potter and the Order of the Phoenix, in which Bellatrix Lestrange kills Sirius Black. Radio waves travel at the speed of light. The title text jokes that these memes are so annoying that it would give us further incentive to develop the technology to travel faster than light, just simply to be able to outrun the radio waves, reach a distant star system, and apologize in advance to the "residents" about the memes, before the memes arrive.

Table with memes[edit]

The table below lists all the memes described, and the star at which the comics states those memes should be heard by the time when the comic was released in 2013. The year of the meme plus the number of light years to the star should end up close to 2013.

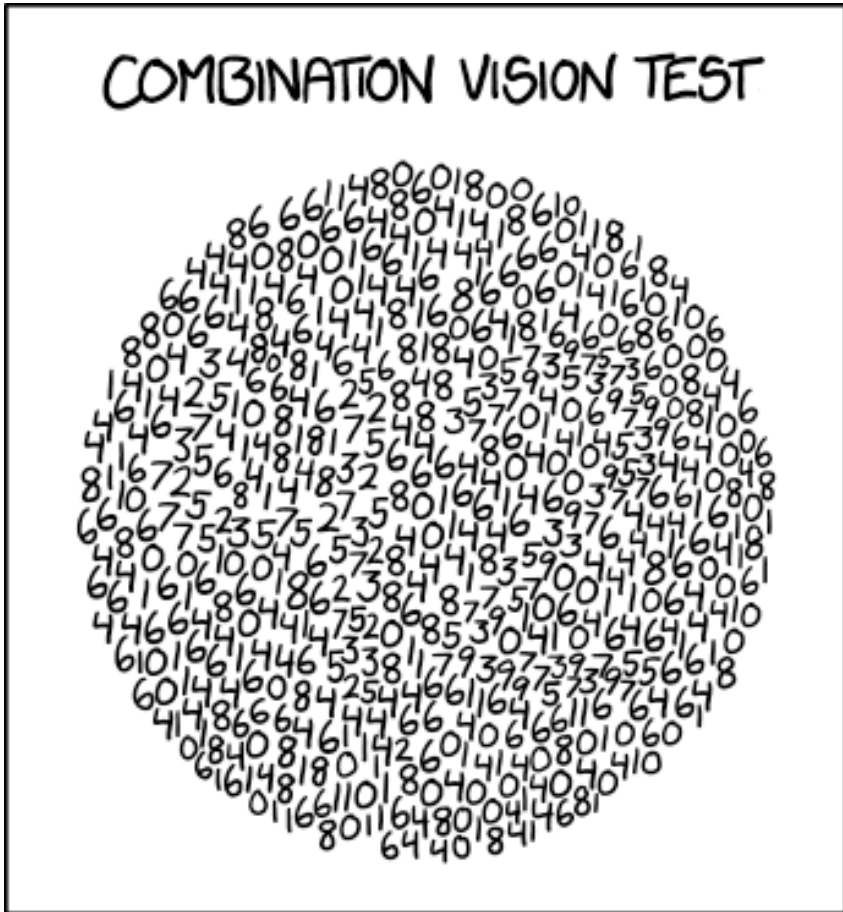
Most end up within the range 2011-2013 which may indicate the meme became popular one or two years later (on Earth or at the distant star system.) Two memes reach the targets in 2014. Some of those errors may be caused by the inaccuracy of the distances.

The The Spanish Inquisition from Monty Python would have reached its destination in 2006. Because they're still watching Monty Python's Flying Circus in 2013 it must be very popular or

maybe it took seven years to decipher that British humour.

#1213: Combination Vision Test

May 17, 2013



IF YOU CAN SEE ONE BIG NUMBER BUT NOT THE OTHER,
YOU HAVE SYNESTHESIA AND COLORBLINDNESS.

If you see two numbers but they're both the same and you have to squint to read them, you have synesthesia, colorblindness, diplopia, and myopia.

Explanation

Synesthesia is a condition in which perception in one sensory or cognitive pathway leads to automatic, involuntary experiences in a second sensory or cognitive pathway. Common examples are experiencing colors when seeing numbers or words (Grapheme-color synesthesia), hearing tones or music while reading words or text, seeing sequences of numbers or month names in a distinct and fixed shape (Number form), etc. In 1608: Hoverboard Megan stands at the end of the Star Destroyer and wishes she had synesthesia so bad she can taste it...

Color-blindness is one of a number of conditions in which a person cannot distinguish certain pairs of colors that other people without color-blindness might find easy to distinguish. There are many different forms of color-blindness; the most common is an inability to separate the colors red and green.

There are two numbers embedded in the big circle of numbers, in a similar way to a common color perception test. But this test can not work for colors because it is just a black-and-white picture. Nobody can see it. However, the joke lies in the fact that those with one common form of synesthesia see colors associated with numbers. Randall implies that a synesthete will see colors connected to each number, and thus a color perception test will work after all - thus distinguishing synesthetes with color-blindness from those with normal color

perception.

The comic playfully suggests that if you have synesthesia as well as colorblindness, then some of the colors might appear identical and so one number would not be visible, only leaving the other number.

The title text brings in two more conditions: diplopia, or double vision, and myopia, or near-sightedness. Those who are near-sighted sometimes see distant objects more clearly while squinting. Then they would be able to see the one large number still visible from the synesthesia/colorblindness combination, but because of double vision they see a second copy of it, hence two numbers that are the same.

If we color the numbers in the circle in a consistent way (and leave the 2, 3, 5, 7 and 9s black) we can reveal the large numbers:

The numbers are four and two, forming the number 42, which is the famous "Answer to the Ultimate Question of Life, the Universe, and Everything", according to the book *The Hitchhiker's Guide to the Galaxy*. The number 4 is formed by digits 2, 3, 5 and 7 (the single digit primes) while the number 2 is formed by digits 3, 5, 7 and 9 (the single digit odds, excluding 1).

For Randall's test to work (i.e. for either the large 4 or the large 2 in '42' to get lost in the noise to those with a given color-blindness), either the little number 2 or the little number 9 would have to be lost in the background noise.

So, for example, if the background appeared in shades of red and the little number 2 was a shade of green, then the large number 4 would be less visible to those with red-green color-blindness than to others.

While it makes for a good joke, there are three reasons this kind of test wouldn't work in real life.

The first is that there is no one set of color-number associations seen by all synesthetes. So while some synesthete might see '2' as green and '0' as red (so a red-green color-blind person would lose anything made up of '2's against a background of '0's), others might see '2' as yellow and '0' as blue, or any other association imaginable.

The second reason it wouldn't work is that synesthetes do not (always) automatically see a 1:1 overlay of color on top of a number - they still need to read the number legibly. Randall's circle is very chaotic, so one wouldn't intuitively identify each single number. For a synesthete the color is produced after the number is recognized by the brain and lost when the focus shifts to the next number. However, some synesthetes may find if they pay attention to the numbers one by one they can make something out. However, as noted by a user in the discussion, who states that he has a type of synesthesia, he did indeed see the numbers! Furthermore, in his blog's discussion section, one person commented they could see the large '2' but not the large '4'! This was not because the person was colorblind, but because the '4' was mostly composed of numbers ('2's and '7's) whose colors

blended in with the background, while the '2' contained an even mix of numbers, some of which (presumably '3's, '5's, and '9's) starkly stood out, making the large '2' easily visible. However, one could easily imagine this scenario pertaining to colorblindness: for example, a colorblind synesthete, in theory (although the third reason makes it clear why this would be extremely unlikely), might perceive most of the background numbers as shades of green (similar to the picture below) and see the '2's and '7's in shades of red, which would make it difficult to differentiate between the giant reddish '4' and the greenish background.

The third reason the test would not work is that color-blindness is an inability to distinguish colors of light hitting the retina, it's nonsensical to imagine a synesthete would perceive two separate colors that they cannot normally separate anyway. But again in the above mentioned link this particular person did see the colors in a way where people with red/green color-blindness might have a harder time seeing the 4 than the 2 in 42.

The next image shows all of the numbers, including 2, 3, 5, 7 and 9, colored in, in such a way as to ensure the number 42 is clearly visible to those with no particular blue-yellow color-blindness:

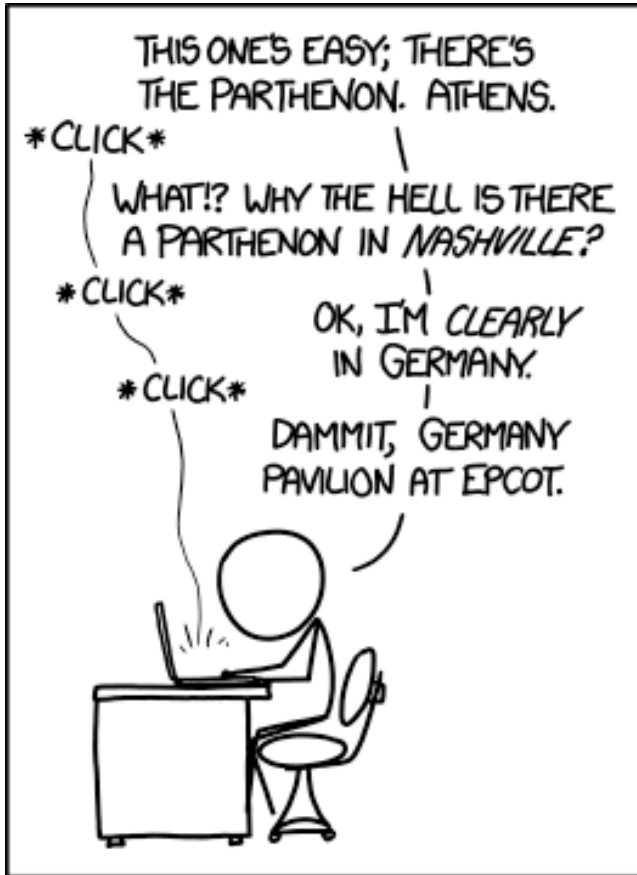
The "real problem" is actually that if a synesthete does indeed see the digits as colors that resolve into either one or two numbers, then what color would these new "color-numbers" then appear to be? If a synesthete could see both large numbers AND they appeared as the same

color as the small numbers as soon the synesthete perceived the numbers, then what would this meta-synesthete see? The '4' would blend in with the background '4's, while the '2' would stand out (as '2' was not used in the background). Would that mean that as soon as they noticed the giant '4', it would suddenly disappear into the background? Is this sort of layered synesthesia even possible?

Keep in mind, as noted above, that synesthetes do not all see the same color-number associations. They also do not necessarily see every number in a different color, as depicted here, and may even see some numbers as purely black.

#1214: Geoguessr

May 20, 2013



MY SCORES IN GEOGUESSR WOULD
BE HIGHER IF PEOPLE WOULD QUIT
BUILDING REPLICAS OF EVERYTHING.

I'm not sure if you can get Epcot, but my friend just got LegoLand. He guessed California but it was the one in Denmark. Meanwhile, I'm rapidly becoming a connoisseur of unmarked dirt roads over flat, barren landscapes.

Explanation

Geoguessr is a game in which the player is given a location in Google Street View and asked to guess precisely where in the world they are, by clicking on a map of the world, based only on the 360-degree view in the Street View display.

Cueball is upset because he keeps making his guesses based on landmarks and his guesses end up being wrong. After all, the landmark he based his guess off of was a replica of the real one (the Parthenon in Nashville, which is more than 9000 kilometers or 5600 miles away from the Greek original).

Of course, from a statistical perspective, this makes sense. For every famous object, there are countless replicas; however, most people will be familiar with the specific location of the original object, and the vast majority of famous objects (except a few notable works of art) exist in only one place in the world. Take the Statue of Liberty, for instance — although the original is based in New York (well, actually, the original maquette is in Paris...), it has hundreds of replicas all over the planet.

Epcot is a Disney theme park in Florida which among other attractions includes pavilions of various countries, including Germany, which are built to resemble the typical style (architecture, vegetation, etc.) of the countries. Therefore, similarly to the replicas of landmarks, in this specific case, recognizing classic

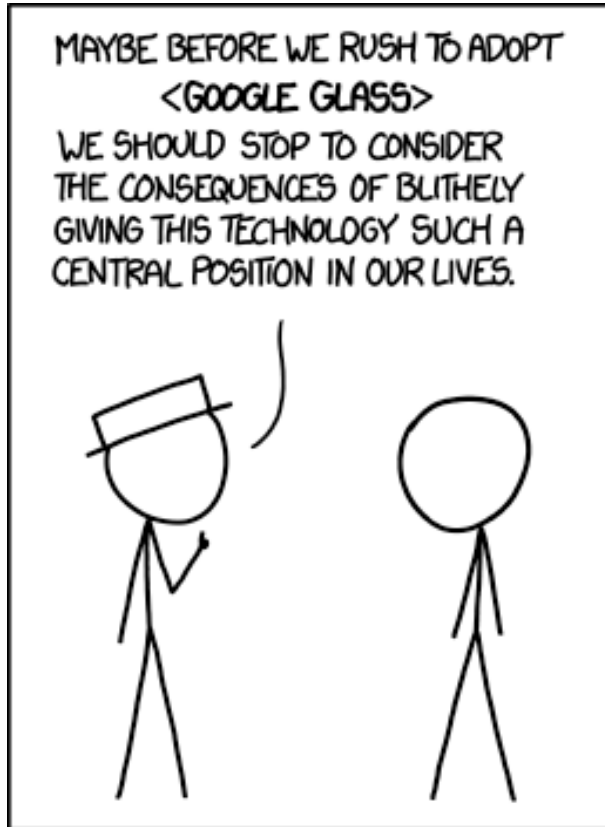
German architecture would put you on the wrong continent.

However, as the title text alludes to, you're far more likely to find a dirt road than to find anything recognizable, since Google Street View maps roads more than anything else (hence its name). Becoming a connoisseur of such a mundane thing bears similarity to 915: Connoisseur.

Anyone who's ever played with Geoguessr knows, also, that seemingly helpful clues can sometimes be useless. For instance, if you recognize the Cyrillic script on a sign, the countries using the Cyrillic script such as Bulgaria, Mongolia, Belarus, Ukraine, and Russia encompasses an enormous area, so unless you can recognize a specific region, there's no obvious place to guess where you can hope to get high points. Unlike somewhere like England, where guessing London is guaranteed to put you within a reasonable distance from a global perspective. Legoland is a good example of this: If you can't tell if you're in Denmark or California (or any of the other locations), it's not like you can just guess halfway between and do well.

#1215: Insight

May 22, 2013



DON'T HAVE ANY INSIGHTS ABOUT A NEW TECHNOLOGY? JUST USE THIS SENTENCE!
IT MAKES YOU SOUND WISE AND YOU CAN SAY IT ABOUT VIRTUALLY ANYTHING.

The great thing is, the sentence is really just a reminder to the listener to worry about whatever aspects of the technology they're already feeling alarmist about, which in their mind gives you credit for addressing their biggest

anxieties.

Explanation

White Hat is giving a profound insight into <Google Glass>. This insight, however, can be given, sounding just as profound, for any other new technology that comes around—hence the angled brackets around Google Glass, indicating that "Google Glass" is a placeholder. This, of course, means it is not profound at all, as it has no actual insight into Google Glass (or any other technology).

The title text highlights a common trait of human listeners. The above sentence is constructed in such a way as to trigger the listener's reservations about the new technology. The sentence sounds profound, not because it has any actual insights, but because it causes the listener to fill in the missing insights with their own pre-existing thoughts on the matter. This is a typical effect of Confirmation bias. Not only does this cause Cueball to regard White Hat as insightful, but it also causes Cueball to think that White Hat agrees with whatever it is that Cueball fears <Google Glass> for.

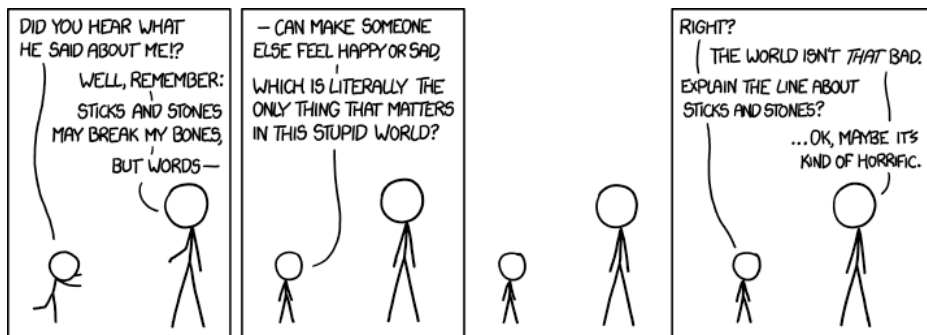
It seems no coincidence that Randall chose Google Glass as the placeholder. It seems generally that he is no fan of these, which was shown soon after in 1251: Anti-Glass and later again in 1304: Glass Trolling. This was the first time Google Glass was directly mentioned but since this comic Google Glass has become a recurring theme in xkcd.

The caption is reminiscent of Randall's tips, but since the word tip is left out, it is not itself a tip comic.

- 174: That's What SHE Said
- 1656: It Begins
- 559: No Pun Intended
- 178: Not Really Into Pokemon
- 1022: So It Has Come To This
- 1627: Woosh

#1216: Sticks and Stones

May 24, 2013



Sticks and stones may break my bones, but words can make me think I deserved it.

Explanation

Sticks and Stones is a nursery rhyme, one common variant of which goes as follows:

The rhyme is often used by parents and teachers to persuade a child to ignore mean taunts and name-calling that others use to try and hurt the child's feelings. The idea is that you haven't been hurt physically, so it shouldn't be a big deal.

The comic challenges this sentiment when the child responds that, although words can't harm you physically, they can change how you feel, and he considers that to be "the only thing that matters in this stupid world." Cueball replies optimistically, by claiming that the world really isn't that bad. The child refers again to the rhyme, observing that the physical world can be harsh, because there are things like sticks and stones that break your bones and presumably people who use them as weapons to do so. Or yet worse, that someone would think up such a gruesome saying in the first place. Upon reflection, Cueball agrees that this image is actually horrific.

The title text is rather dark, and is probably a reference to the currently active bullying and shaming culture.[actual citation needed] None of us deserve to be beaten or stoned,[citation needed] but words are powerful enough to make us think that we do.

Recent studies (for example: Social rejection shares somatosensory representations with physical pain) have shown that, in fact, the brain's reactions to physical pain and emotional rejection are somewhat similar and even feed into each other.

#1217: Cells

May 27, 2013

WHEN YOU SEE A CLAIM THAT A
COMMON DRUG OR VITAMIN "KILLS
CANCER CELLS IN A PETRI DISH,"

KEEP IN MIND:



SO DOES A HANDGUN.

Now, if it selectively kills cancer cells in a petri dish, you can be sure it's at least a great breakthrough for everyone suffering from petri dish cancer.

Explanation

Cancer is one of the most feared group of illnesses due to high mortality and a topic visited by Randall in past comics.

Whenever a study finds a hint of a cure, it is hyped up in media as major breakthrough. However, because research is done in a laboratory using cultivated cancer cell assays in petri dishes or well plates, it typically does not take interactions with other parts of a body into consideration, which is ultimately necessary for a patient to survive treatment without harmful side-effects. In order for a cancer treatment to be viable, it would have to primarily target only cancer cells; not healthy ones. Added to this is the issue that major cancer in the body quickly evolves resistance to most treatments, most treatments end up either unused or used as just one in a cocktail of cancer fighting drugs.

Here, Randall reminds us that there's no need to get excited upon hearing about a drug that kills cancer cells. In general, killing cancer cells is not too impressive for a drug, since something as mundane as a handgun is capable of destroying cancer cells too. On top of that, many substances that kill cancer cells can also harm healthy cells, just as a bullet fired from a handgun would.[citation needed] Cancer treatments may involve generally harmful effects that are carefully applied to preferentially harm cancer cells as much as possible whilst doing the least amount of unavoidable damage to

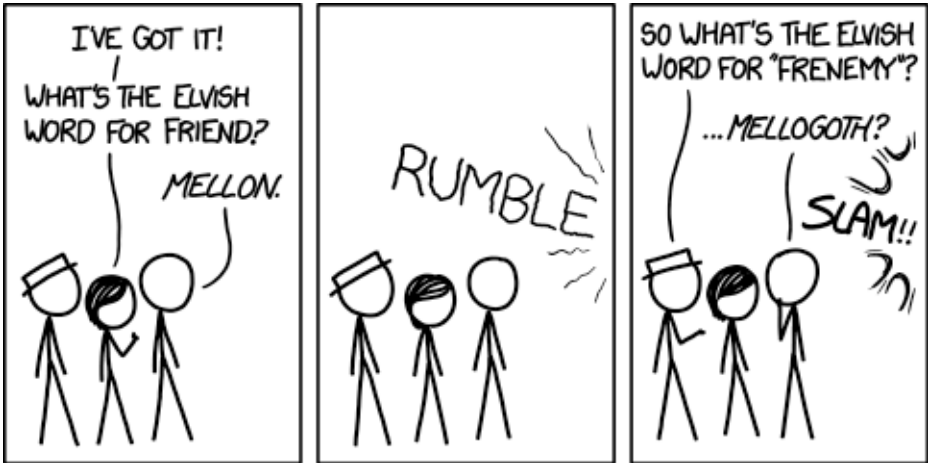
the rest of the body as is practical.

The title text suggests that even if a drug did only kill cancer cells while leaving healthy cells alone, the human body still has many other complex processes that may render a drug that works in a petri dish insufficient. For instance, a drug that kills cancer cells in a petri dish may not be able to get at cancer cells deep within a human body, or it may have side effects that render it unusable. It is a long way from the laboratory to the pharmacy.

A more humorous interpretation of the title text is that it will only kill cancer cells if they are in petri dishes, and not anywhere else. The naming convention here is similar to "lung cancer", breast cancer", etc., but of course, petri dishes are not normally a part of human organism.[citation needed] Less probably, it might be about cancer cells that originated from, but are not necessarily located within, petri dishes, making the scenario even more oddly specific.

#1218: Doors of Durin

May 29, 2013



If we get the doors open and plug up the dam on the Sirannon so the water rises a little, the pool will start draining into Moria. How do you think the Watcher would fare against a drenched Balrog?

Explanation

The comic is based on the Lord of the Rings, specifically a scene from *The Lord of the Rings: The Fellowship of the Ring*, in which the eponymous fellowship is trapped outside the door to the Mines of Moria. There's a spoken password to open the doors, an Elvish inscription on them provides a clue: "Speak friend, and enter". The party leader (Gandalf) initially interprets this to mean that a friend could speak the password and enter. Only after many unsuccessful efforts does Gandalf realize it is actually a very simple riddle: The password is the Elvish word for "friend" ("mellon"), and the inscription should in fact be interpreted as "Speak [out loud the word] mellon [(the Elvish word for friend)], and [you will be able to] enter". See the Wikipedia article [Use–mention distinction](#).

In this comic, Cueball, White Hat, and Megan reenact the scene, with Cueball taking the role of Gandalf. The doors apparently open off-panel when the password is spoken. White Hat then wonders aloud what the Elvish word for "frenemy" is, and Cueball postulates "mellogoth". This is a portmanteau of "mellon" and "coth", much like how "frenemy" is a portmanteau of "friend" and "enemy". The Sindarin word-root *coth*, in its lenited form *goth*, is best known as part of the name of Morgoth (literally, "Black Enemy") of the *Silmarillion*. The doors apparently immediately slam shut the moment Cueball says *mellogoth*. It is unclear whether this is because the opposite of the password has been

spoken, or because the doors take offense to the word/concept frenemy, of which xkcd has previously made fun in 919: Tween Bromance.

According to Fiona Jallings's textbook *A Fan's Guide to Neo-Sindarin*, -n + c- would cause nasal mutation at the word boundary when forming a compound word, so a more correct compound word formed from *mellon* + *coth* would be *mellochoth*.

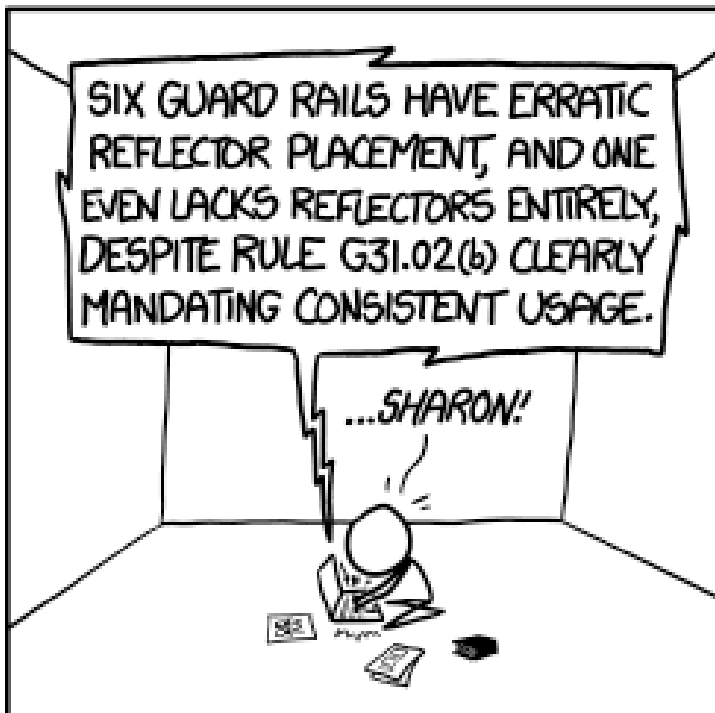
The title text ponders what would occur if the *Sirannon*, a stream running adjacent to the path leading to the doors, were to be completely blocked with the doors left open. The already partially blocked *Sirannon* had formed a pool before the doors; which contained some sort of monstrous horror from the depths of the Earth, referred to as the *Watcher in the Water*. Randall seems to think that the pond draining into the mines would connect the *Watcher* with another horror within: the *Balrog* (a high-level servant of *Morgoth*) living within the depths of the mines. *Balrogs* are primarily creatures of fire and shadow, so having a bunch of water dumped on it is unlikely to please it but may weaken it. He then goes on to wonder about the outcome of a battle between the two monsters.

#1219: Reports

May 31, 2013

HOW TO MAKE BORING TECHNICAL REPORTS MORE FUN TO READ:

IMAGINE THEY WERE WRITTEN AND SENT
IN, UNSOLICITED, BY THE ESTRANGED
SPOUSE OF THE HEAD OF THE PROJECT.



If that fails, just multiply every number by a thousand.
'The 2nd St speed limit should be set at 25,000 mph, which
would likely have prevented 1,000 of the intersection's
3,000 serious accidents last month.'

Explanation

Normally, the text in technical reports is written by technical people working in the same place as the incident. This makes for rather boring, technical text. For the average reader, this may not be very engaging. However, to make it more interesting, Randall asks that the text be read as if it was written because the spouse of the head of the project is making unhelpful personal comments due to their failing marriage. This turns the phrase from being a simple statement of relevant (if potentially dull) facts into an opinionated diatribe compounding all the many sore-points that have turned the relationship sour, or at least have been perceived as such.

This leads onto the related point that the quoted text of the report could (and indeed probably would, given the apparent contents) be stereotypically read out loud by the author, or internally by the reader, in an essentially monotonal manner, as exhibited by any number of popularised film and TV characters such as 'Arthur Pewtey' from the Monty Python sketch. But this comic asks us to imagine it instead voiced in the voice of an upset spouse, presumably berating the project leader on various real or imagined infractions, and it works just as well. The jagged nature of the speech bubble indicates that the report has typed out on the computer's screen, but also helps to re-enforce the nagging internal voice.

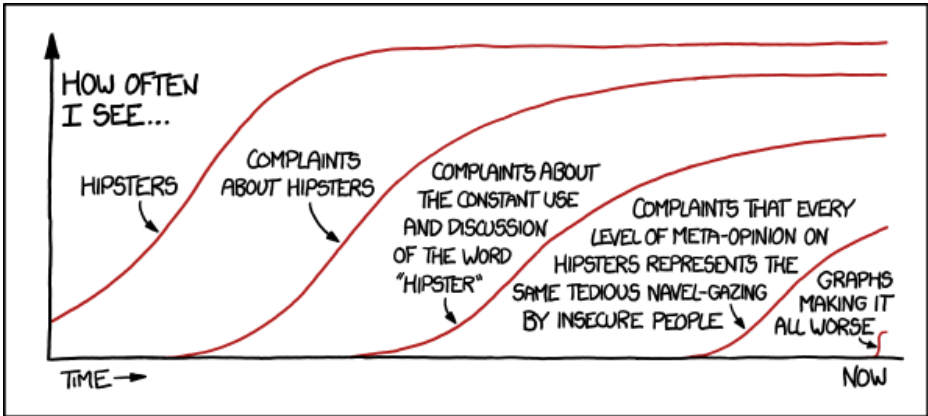
The title text joke relates to an alternative plan, namely to

proportionally exaggerate everything you read. What would have been one serious accident that would have been prevented in the previous month had the speed limit been 25 mph, out of the three that actually occurred under the current limit, now becomes one thousand people saved. And all those lives would have been saved by changing the speed limit to a 'mere' 25,000 miles per hour (which is almost exactly Earth escape velocity). Of course, around 2000 accidents would not have been prevented because people still try to mess with vehicles that are moving at hypersonic velocities.

Note that the title text is inconsistent; if every number were to be multiplied by a thousand, then the speed limit would apply to 2000th Street. Somewhat surprisingly, there do exist streets of this name, mainly in Illinois. Although unlikely, the street may be 0.002th street, giving us 2 when multiplied per the title text. Though in this case 2nd St is a proper noun and thus should not be modified.

#1220: Hipsters

June 03, 2013



You may point out that this very retreat into ironic detachment while still clearly participating in the thing in question is the very definition of contemporary hipsterdom. But on the other hand, wait, you're in an empty room. Who are you talking to?

Explanation

The word "hipster" originally referred to counter-cultural youth and jazz aficionados in the 1940s and 1950s before the Hippie culture developed in the mid '60s. Recently, however, "hipster" has come to refer to, in Wikipedia's terms, "a subculture of young, urban middle class adults and older teenagers that appeared in the 1990s. The subculture is associated with independent music, a varied non-mainstream fashion sensibility, progressive or independent political views, alternative spirituality or atheism/agnosticism, and alternative lifestyles."

Following the hipster resurgence, it became popular in many circles to hold hipsters in contempt, citing their conformity to a subculture by rejecting "mainstream" culture and deliberate (i.e. ironic) indulgence in obnoxious things like moustaches and bad movies. Randall continues the arguably hypocritical meta-complaining by showing more s-curves that represent subsequent, smaller backlashes, self-referentially including his own comic in that meta-complaining.

There is a possible double meaning in the phrase "tedious navel-gazing by insecure people": the word "hipster" also refers to low-rise leg wear that sits at or below the hips, often in conjunction with revealing shirts, thereby exposing one's bellybutton.

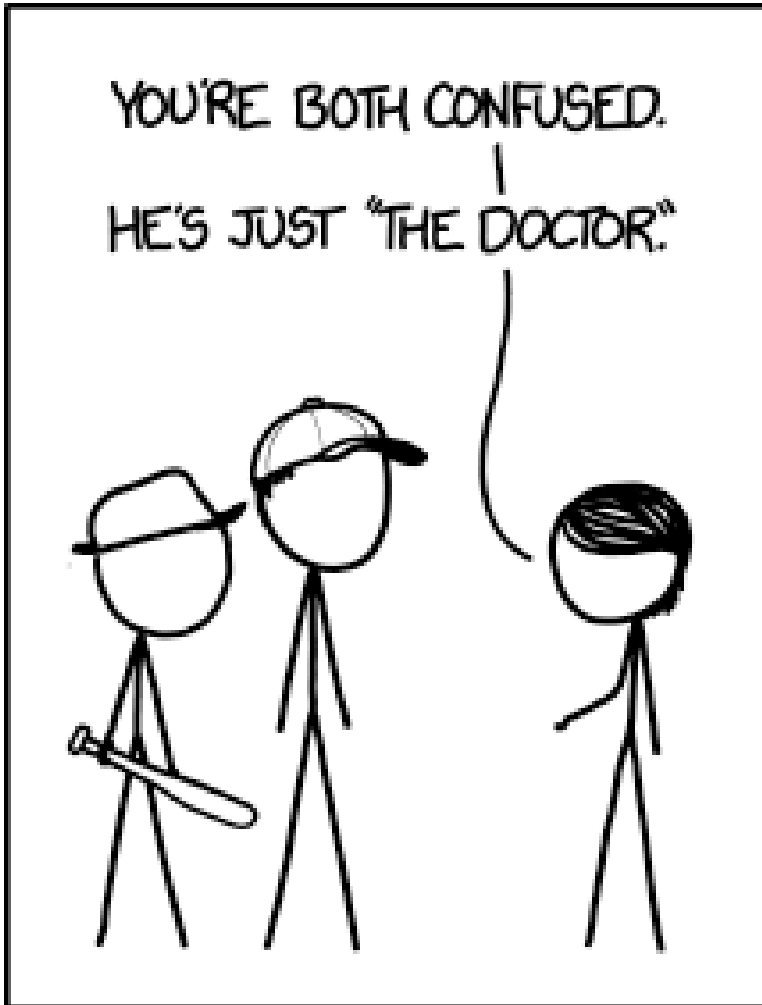
The title text reveals Randall's awareness that he's only

perpetuating the meta-complaining he's complaining about, but he bats away this criticism by pointing out the facts of the situation: the reader is not communicating with Randall but rather most likely in an empty room while browsing the Internet. That is, the criticising reader is experiencing a retreat into ironic detachment while still clearly participating in the thing in question, i. e. the graph.

The title text may be a reference to a previous comic, 525: I Know You're Listening.

#1221: Nomenclature

June 05, 2013



[shouted, from the field] 'Aunt Beast hit a pop fly to second! Dive for it, Mrs Whatsit!'

Explanation

Nomenclature can be defined as the devising or choosing of names for things. Here Randall connects three pop culture references that each contain one or more instances of ambiguous nomenclature based on pronouns: the "Who's on First?" skit, the "Doctor Who" television series, and in the title text also the novel "A Wrinkle in Time" by Madeleine L'Engle.

The comic references the famous "Who's on First?" skit by the American comedy duo Abbott and Costello in the 1930s. This video is one of the original performances. Costello is the shorter character, with a round brimmed hat and baseball bat, while Abbott is taller and wearing a baseball cap. This reflects the most common image associated with the skit. In the routine, Costello is confused by the nicknames the ball players go by. The man playing first base goes by the name "Who", the man on second base goes by "What", and the one on third calls himself "I Don't Know". Costello asks "Who's on first?", inquiring the name of the first-baseman, and Abbott replies "that's right", affirming that the first-baseman's name is Who. Both parties become confused within a matter of seconds.

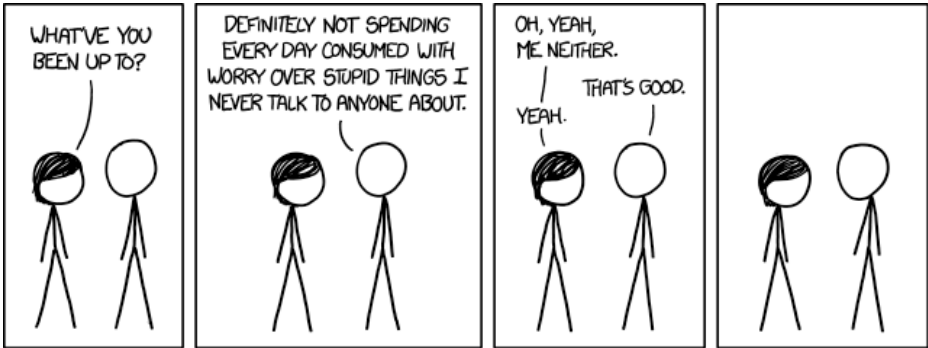
The Doctor from the long-running British television series Doctor Who is often referred to as "Doctor Who" by people who think the series' name and their name are the same (although it should be noted that the name "Doctor Who" is not entirely incorrect; the character was

referred to as such in the end credits for several seasons, as well as in the spin-off theatrical films starring Peter Cushing). In-universe, the character often introduces themselves as "The Doctor", which elicits the response "Doctor who?". Their response to this question is: "Just 'The Doctor'". Megan appears to have interrupted the "Who's on First?" skit to clarify the confusion that the person on first is not called "Who", but just "The Doctor".

The title text references the Madeleine L'Engle novel *A Wrinkle in Time*, which has characters with similarly ambiguous names. Mrs. Whatsit appears to be on second base (like What in the original sketch). Aunt Beast is the batter and hits a pop fly towards second base, while Mrs. Whatsit is being encouraged to dive to catch the ball before it hits the ground, to get the batter out. Another character in the book, Mrs. Who, may also be on the field; Megan may be pointing out that she should be the player referred to as "Who" rather than The Doctor.

#1222: Pastime

June 07, 2013



Good thing we're too smart to spend all day being uselessly frustrated with ourselves. I mean, that'd be a hell of a waste, right?

Explanation

When asked by Megan what he's been up to, Cueball responds with the suspiciously specific denial, "Definitely not spending every day consumed with worry over stupid things I never talk to anyone about.", which suggests that that is exactly what he's been spending every day doing, but he is hiding it from her and everyone else. Megan's response "Oh, yeah, me neither" suggests she too is worrying over stupid things but isn't admitting it.

Instead of discussing their mutual worry and possibly making each other feel better, they instead continue to "not talk to anyone about it" and stand in awkward silence.

The title text continues the irony suggesting it's good that they're too smart to spend all day being uselessly frustrated with themselves, but that's apparently exactly what they are doing.

This could also be a reference to the common response to the question Megan asks in the first panel, "nothing", a response that is almost certainly false, and usually means the same thing that Cueball said, but is usually accepted, if not expected.

#1223: Dwarf Fortress

June 10, 2013



BIG BROTHER REALIZES HE'S TRAPPED
IN THE MOST TEDIOUS POSSIBLE HELL.

I may be the kind of person who wastes a year implementing a Turing-complete computer in Dwarf Fortress, but that makes you the kind of person who wastes ten more getting that computer to run Minecraft.

Explanation

This comic is a reaction to the recent reveal of a U.S. electronic telecom surveillance program called PRISM, run by the NSA. There is a Guardian article about it. PRISM, leaked by a former NSA official, incited some controversy since it provides government access to private data (e-mails, videos, chats, file transfers, etc.).

Dwarf Fortress is a freeware strategy game in which the player builds a civilization by giving orders to — as opposed to directly controlling — a group of dwarves. It is famous for having a very detailed simulation of its world and for allowing deep micro-management (as well as an incredibly difficult learning curve).

"Big Brother" means "a tyrannical government body that constantly monitors all its citizens." The term comes from the classic dystopian novel *Nineteen Eighty-Four* by George Orwell, wherein propaganda videos are narrated by an actor with the stage name of Big Brother and the dystopia's surveillance system is said to be monitored by Big Brother himself.

Cueball has a discussion with Big Brother ("corporate surveillance state"), in which he mocks Big Brother's interest in the inconsequential activity of playing a video game (Dwarf Fortress in particular) by drawing a parallel between Big Brother's omniscient surveillance of Cueball and Cueball's omniscient surveillance of the dwarves. Big Brother appears to be mortified when it realizes the

accuracy of Cueball's comparison.

Informally, a system exhibits Turing-completeness when it is theoretically capable of executing any algorithm. One of the simplest Turing-complete systems is the Turing machine, a device that manipulates symbols on a strip of tape according to a table of rules — it can be proven to have the same capabilities as any ordinary programming language. Other very simple systems include Rule 110, lambda calculus, Conway's game of life, and Brainfuck. The reason we don't work with these is because they're a real pain in the ass. Would you rather build a network of spaceships that collide with each other to simulate the successor function, or just write $i := i + 1$?

A common CS nerd challenge is to prove the Turing-completeness of a system that wasn't intended to be that way — games in particular. The usual way to do this is to construct a Turing machine simulator within the system. It has been done for Dwarf Fortress, (infinite) Minesweeper (pdf), Magic the Gathering, Little Big Planet, Minecraft (another Minecraft example)¹, Pokémon Yellow (through the elaborate use of many in-game glitches) and 3D chess. These kinds of proofs often involve formulating ridiculously complex creations just to simulate a little machine writing symbols on a tape!²

Finally, Randall makes a crack that users will try to nest their Turing-complete computers; after finishing his Turing-complete Dwarf Fortress computer, someone else will try to make the Dwarf Fortress computer run

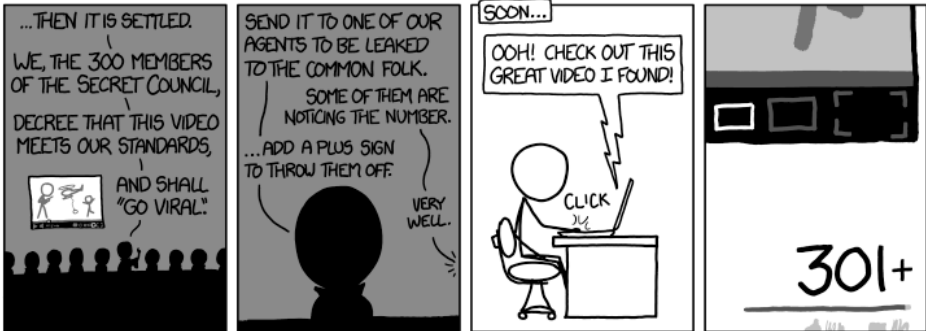
Minecraft (a highly inefficient process that would be a nightmare to coordinate, and would run incredibly slowly).

1 The youtuber legomasta99 even built a whole programmable PC in Minecraft as can be seen [here](#).

2Technically, a computer is not really Turing-complete. A Turing-complete system has to have unlimited space, and that's not possible for a memory-limited computer or any software running inside it. But even if we don't have access to Turing-completeness, we can build a theoretical machine and show how it can be extended indefinitely. In a few of the games, we prove Turing-completeness in infinite variants.

#1224: Council of 300

June 12, 2013



'And hypnotize someone into thinking they've uploaded it and passed it around.' 'But then won't the uploader get suspicious that it pauses at 301+ for a while? Why don't we just forge the number entirel--' ::BLAM:: 'The Council of 299 is adjourned.'

Explanation

YouTube (a video sharing site) used to have an odd quirk in its view counter. When a video hit 301 views, the view counter briefly stopped updating. This meant that YouTube was checking the views to make sure that no foul play was going on. The choice of the number 301 is due to a harmless off-by-one error; Numberphile produced a video that explains all this very well (and has comically its view counter frozen at 301). At times the number 301 would catch some YouTubers off guard — for very popular videos, it might appear that the video has more likes than views. However, this bug is no longer present[actual citation needed] (although very new videos having more likes and comments than views IS still present).

Randall plays with the near coincidence of this number, and a conspiracy theory entity known as the Committee of 300. In this case, the video's first 300 views come from each of the Committee's council members who determine if the video will go viral. The video is then released to the public by sending it to a regular person (Cueball in this comic) making the total number of views 301.

The title text elaborates on this by explaining that the council also hypnotizes somebody to make him think they uploaded and shared that particular video.

According to the title text, the council does not seem to

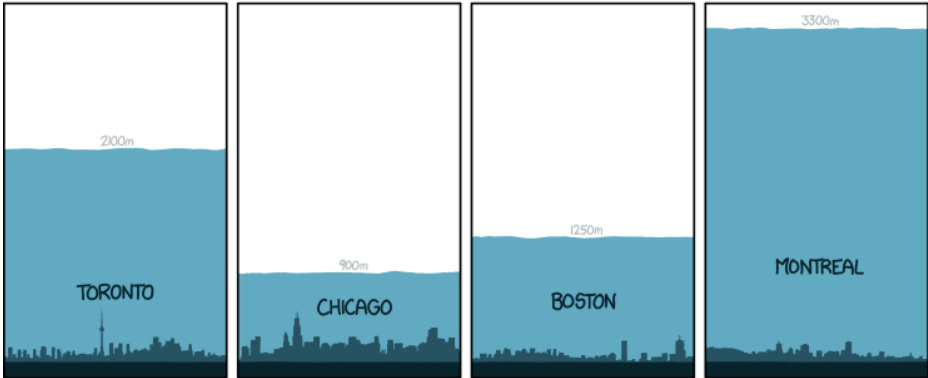
tolerate contradiction, because the member that suggests changing 301 to a random number to avoid suspicion is shot, silenced permanently, and removed from the council, therefore bringing the total number of people in the council down to 299.

#1225: Ice Sheets

June 14, 2013

THICKNESS OF THE ICE SHEETS

AT VARIOUS LOCATIONS
21,000 YEARS AGO
COMPARED WITH MODERN SKYLINES



Data adapted from 'The Laurentide and Innuitian ice sheets during the Last Glacial Maximum' by A.S. Dyke et. al., which was way better than the sequels 'The Laurentide and Innuitian ice sheets during the Last Glacial Maximum: The Meltdown' and 'The Laurentide and Innuitian ice sheets during the Last Glacial Maximum: Continental Drift'.

Explanation

The comic shows the ice levels at major North American cities at the peak of the last ice age, 21,000 years ago. During this period, a vast amount of frozen water covered North America as well as other areas around the world. So much ice that it affected the global sea level (see Sea level rise) to lower it by more than a hundred meters.

Toronto and Montreal are both Canadian cities, while Boston and Chicago are in the United States. The skylines of each city are shown at the bottom of the ice sheet to scale. The tallest structure shown is the CN Tower in Toronto, the tallest free-standing structure in the Western Hemisphere, at a height of 553 m. The tallest ice sheet is 3.3 km tall, almost six times as tall as that tower. Although, over Toronto, the ice was "only" 2.1 km tall.

The tallest ice sheet takes up 265 pixels. From that, each pixel is about 12.4 meters and the height of the panels is 3.7 km with less than 200 m of the ground shown in black below the cities making the white "air" above ground reaching up to 3.5 km, leaving only 200 m of air above the highest ice sheet.

The title text references the "The Laurentide and Innuitian ice sheets during the Last Glacial Maximum (PDF)," an actual series of scientific papers about the ice sheet (see figure 4). But it also refers to the animated Ice

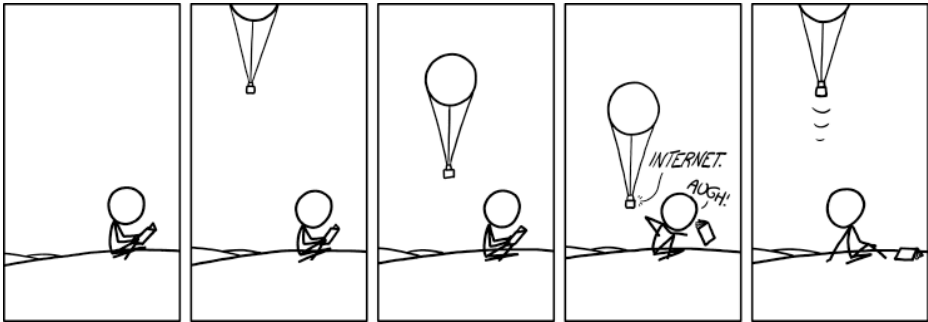
Age film series, specifically to Ice Age: the Meltdown, and Ice Age: Continental Drift which are the second and fourth Ice Age films.

Ice sheets over Boston during the last ice age was also referenced in 1379: 4.5 Degrees. The image of Boston in this comic is reused at the top of the huge chart in 1732: Earth Temperature Timeline, and had already been reused earlier in the what if? post Google's Datacenters on Punch Cards. Randall lives in that area.

Although this comic doesn't mention (modern) climate change, it does show the difference climate can have on our surroundings. And in the two later comics mentioned above, Randall makes it clear that we are now heading as far in the opposite hotter direction compared to the "normal" temperature during the rise of human civilization, as the ice age temperature was colder.

#1226: Balloon Internet

June 17, 2013



I run a business selling rural internet access. My infrastructure consists of a bunch of Verizon wifi hotspots that I sign up for and then cancel at the end of the 14-day return period.

Explanation

The comic references Google's Project Loon, a balloon powered Internet service which was officially announced June 14, 2013 (3 days before this comic was published) and was in proof-of-concept testing stages by that time. A test above New Zealand, involving about 30 balloons and about 50 users, was successfully conducted on June 16. The project, taglined "Internet for Everyone", was intended to eventually provide Internet access to people in rural areas and in disaster areas that have limited or no access to land-based Internet services.

As of 2019 Loon LLC was an individual Google subsidiary instead of a mere project and was present in multiple places across the world for either Internet in rural areas, full coverage of a country or disaster relief.

In March of 2021, Alphabet, Google's parent company, announced the closure of Loon, LLC.

Randall is poking fun at the tagline "Internet for Everyone" — meant to mean anyone could have Internet access regardless of location — by instead literally bringing the Internet to Cueball, who sits in a deserted area, away from all technology, to read a standard paper book. In the comic, one of the balloons sneaks up on Cueball before speaking and startling Cueball, effectively becoming a nuisance, interrupting Cueball's reading of a book and leaving Cueball wondering what has happened. In Randall's world, the tagline could be restated as "Internet for Everyone — whether they want it or not".

The title text describes Randall's own plan to provide rural internet. He will operate in a region where Verizon cellular data service already exists, and take advantage of their 14-day return policy to effectively obtain internet access for free, which he will then sell under his own brand.

June 19, 2013

'Unfortunately, the notion of marriage which prevails ... at the present time ... regards the institution as simply a convenient arrangement or formal contract ... This disregard of the sanctity of marriage and contempt for

its restrictions is one of the most alarming tendencies of the present age.' --John Harvey Kellogg, Ladies' guide in health and disease (1883)

Explanation

The debate as to whether or not the pace of modern life is detrimental to society, culture, and the human experience in general has been going on for longer than we may realize. Presently, the debate has focused on technology such as smartphones, tablets, and other portable electronics; however, many of the same arguments were made against newspapers, magazines, telegraphs, telephones, and even written correspondence 100 years ago.

People often tend to think of older times as better. The people complaining compare their present time to the time they lived in before, that is, a couple of decades ago, and this has been happening for over a century (at least). This comic makes a point that the older times people refer to, were also criticized in exactly the same fashion. Since the same criticism is applied to each generation by the generation before that one, every generation thinks that the one they were born in is the good one. This is presentism as explained by Randall in 24: Godel, Escher, Kurt Halsey.

The comic begins and ends with very similar arguments, perhaps emphasizing how these debates cycle and repeat over time. The comic does not directly state whether these opinions and criticisms were justified or simple fallacies. There is a desire to consider our present existence as good and reasonable and that society has been improving over time. The difficulty lies in

considering the possibility that each generation was perhaps correct in their criticism.

On reading all of these quotes, one may find these quotes redundant and tiresome to read. Readers may find themselves skimming the text and skipping several quotes once they get the overall idea. This could be a self-referential point demonstrating that the writing style of older times was less convenient than the oft-criticized brief modern style.

Some parts of all that long texts are in bold, others not. Here is the summary for only this bold text, picturing just our Modern World:

The style of the comic is very similar to that of 1311: 2014, which was released half a year later.

The title text shows that the meaning of the institute of marriage debate has likewise been going on for quite some time.

#1228: Prometheus

June 21, 2013



FIRE WANTS TO BE FREE.

'I'm here to return what Prometheus stole.' would be a good thing to say if you were a fighter pilot in a Michael Bay movie where for some reason the world's militaries had to team up to defeat every god from human mythology, and

you'd just broken through the perimeter and gotten a missile lock on Mount Olympus.

Explanation

This comic is most likely about copyright and patent, which are temporary government-granted monopolies for authors and inventors. It refers to the cultural hero Prometheus in Greek mythology who stole fire from the gods and gave it to humanity. In this case, Prometheus claims that it is more like sharing than stealing because the gods still have the original fire. By analogy, uploading music, movies, and software is more like sharing than stealing because the authors and inventors still have the original files. Fire-sharing is a pun for file-sharing. "Fire wants to be free" is a pun for the slogan "Information wants to be free."

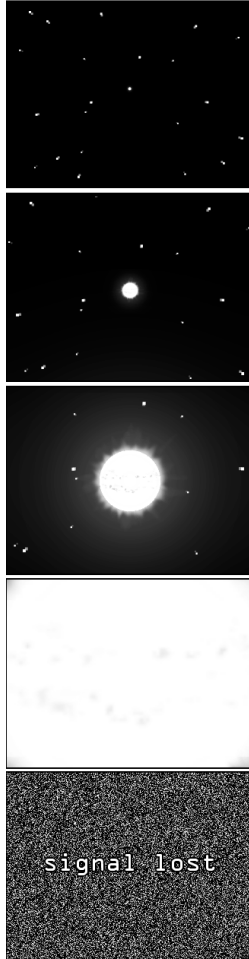
This could also be a reference to the strict punishments of copyright laws as one could be fined a lot for failing to comply with the copy and Prometheus was also heavily punished by having an eagle rip out his liver every day and the liver regrowing every night.

The title text refers both to Michael Bay, the director of the movies *Transformers* and *Armageddon*, who is known for using over the top special effects, and to the novel "Salvation War" by Stuart Slade, in which Humanity goes to war just as described. "Returning fire to the gods with interest" is also the plot of the Terry Pratchett novel *The Last Hero*; Randall has previously made references to Terry Pratchett.

#1229: Screensaver

June 24, 2013

I'VE BEEN STARING AT THE SCREEN
EVERY NIGHT FOR TWENTY YEARS,
AND IT FINALLY HAPPENED.



I'm entering my 24th year of spending eight hours a day firing the Duck Hunt gun at the flying toasters. I'm sure I'll hit one soon.

Explanation

This comic features the "Starfield" screensaver, a popular Windows screensaver of the 1990s, which presents a moving starfield, like what would be seen by an observer moving past stars at superluminal speeds (see a video example). This illusion is generally created by drawing white dots on the computer screen, and then moving these dots outwards towards the edge of the screen before disappearing. Some of the "stars" appear to pass closer to the viewing point than others, resulting in movements of visually greater speeds, and more excitement; one can also fixate the center of the screen, hoping to see the appearance of a star as close as possible to it, which would later on pass very close to the viewpoint. This comic extends it to the situation where the observer actually collides with one of these stars, something that never happens with screensavers of this type. The "signal lost" error message appears because the source of the signal is no longer transmitting, since it was destroyed when colliding with said star. It appears that the screensaver was generated by a real spacecraft taking pictures of the space.

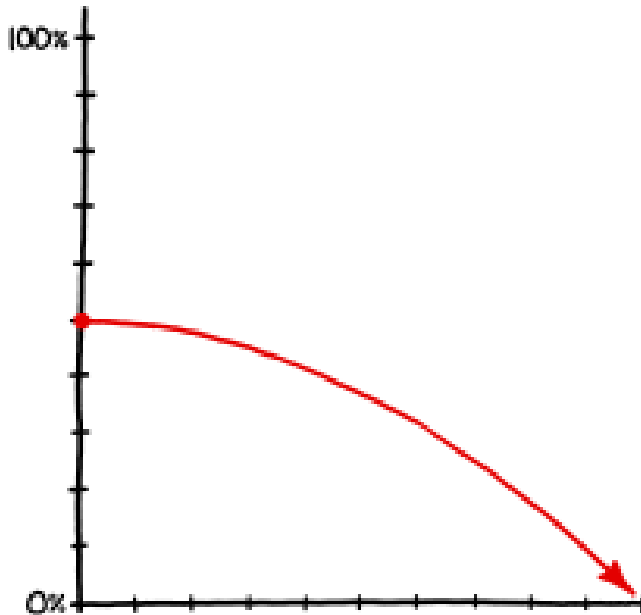
The "Duck Hunt gun" is a reference to the NES Zapper used with the Nintendo Entertainment System game Duck Hunt, originally published in 1984. The user would point the Zapper at the connected television screen while playing Duck Hunt, and the NES would recognize whether or not the zapper was pointed at an appropriate target or not. "Flying Toasters" is another old

screensaver (in the After Dark package, made for computers but not for the NES). In the title text, Randall states that he is trying to use the NES Zapper to shoot down flying toasters. However, the Flying Toaster screensaver and the NES Zapper are two separate things that were never meant to be used together, so the flying toasters will never react to being "shot" at by the NES Zapper.

#1230: Polar/Cartesian

June 26, 2013

CERTAINTY THAT THIS IS A
CLOCKWISE POLAR PLOT,
NOT A CARTESIAN ONE,
AS A FUNCTION OF TIME:



Protip: Any two-axis graph can be re-labeled 'coordinates of the ants crawling across my screen as a function of time'.

Explanation

This comic plays upon the difference between reading a polar coordinate plot and the more common Cartesian coordinate plot.

The graph purports to show the certainty in the viewers mind that it is a clockwise polar plot, as a function of time.

If seen as a Cartesian plot, the y (vertical) axis represents 'certainty' while the x (horizontal) axis represents 'time'. Each point on the plot is represented by two coordinates, the x-value and the y-value. As time increases, we move to the right and see the initial certainty of 50% decreases gradually to zero. That is, after a certain amount of time, we are certain that it is NOT a polar plot.

In a polar plot, each point on the plot is also located by two values, but in this case they are the radius (the distance from the origin) and the angle between the radius and an arbitrary starting line. Here, the radius represents 'certainty' and the angle to the vertical represents 'time'. In this view, we see that as time increases (as we move clockwise around the plot) the initial certainty (the same 50%) now increases to a final value of 100%. That is, after a certain amount of time, we are certain that it IS a polar plot.

The intended joke seems to be that the graph is an exercise in confirmation bias. Whichever type you

initially hypothesize is correct, that view will be confirmed by investigation. This is because the two different views are both correct - the graph can equally be considered a Cartesian or polar plot. This is somewhat counter-intuitive.

Throughout the graph, the sum of the two probabilities is 100%, i.e. (polar-observer's certainty that the graph is polar) + (Cartesian-observer's certainty that the graph is polar) = 100%. The shape of the graph appears to be (in clockwise polar form) $r(t)=100/(1+\cos(t))$.

If the reader is open-minded, they would never reach certainty (0% / 100% depending on how you read the graph) because there isn't enough information to clearly decide either way.

The title text is a joke that if you are unsure how to label any two-axis (two-dimensional) graph, you can just say it represents the 'coordinates of the ants crawling across my screen as a function of time', and nobody could then argue with your data. "Hey, that's the path they walked!"

#1231: Habitable Zone

June 28, 2013



TO MESS WITH AN ASTRONOMER, PUT A MIRROR IN THE PATH OF THEIR TELESCOPE.

They have a telescope pointed RIGHT AT US!

Explanation

While searching for extrasolar planets this gullible astronomer is very excited because he believes he has found a planet in a star's habitable zone, with oceans and visible weather. From these observations, he has determined that it is quite likely to have life on it, which would be a major groundbreaking discovery.

The caption explains, however, that someone has used a mirror as a prank to fool the astronomer, so he is in fact looking at a reflection of the Earth.

The title text goes on says that the astronomer would also be able to see the reflection of his telescope, which would convince him that there definitely is intelligent life on the other planet, looking straight back at him no less!

Pedantic Comments[edit]

There are quite a number of issues (listed below) with the practical implementation of this prank, though of course they don't matter much in terms of the joke itself.

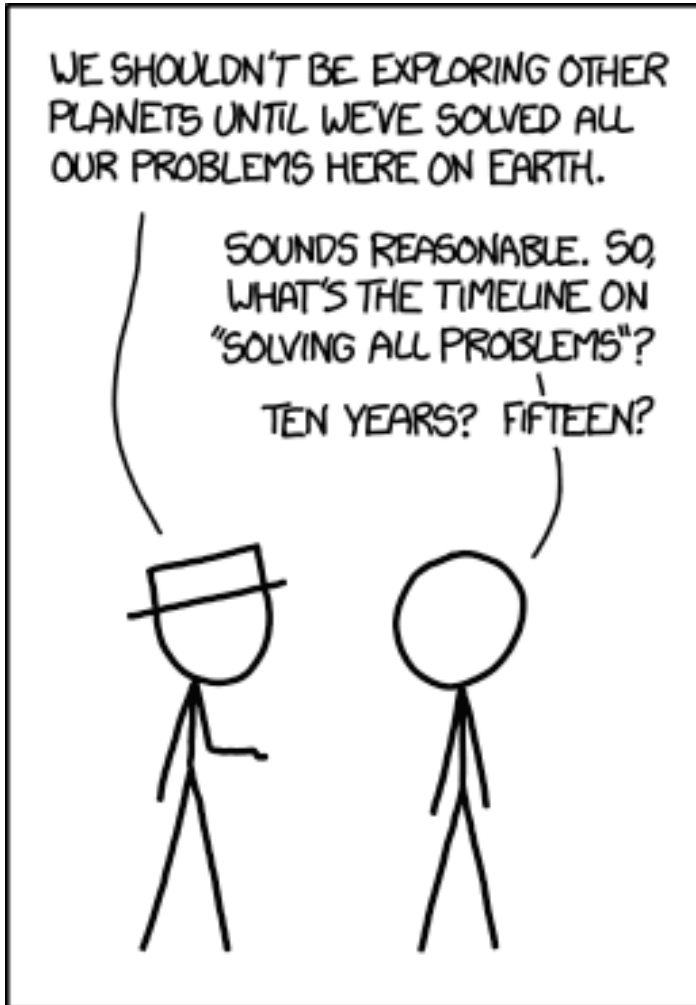
- The telescopes used for this type of research are designed to view faint, distant objects. In the images that they produce, objects the size of telescopes are not visible. Therefore, the astronomer would not see the reflection of the telescope.
- The telescopes have a motor that moves them to compensate for earth's rotation, so that they stay pointed on the same part of the sky. This means that the telescope would not stay pointed at the mirror. The prankster would have to move the mirror in a very

precise way to maintain the illusion.

- For the astronomer to have ascertained that the planet is in a star's habitable zone means that the astronomer observed the planet to be the size of Earth and observed the distance between the planet (Earth) and its star (the Sun), and the approximate size of that star. However, in a mirror at any reasonable distance from the Earth, up to several times the distance of the moon, the Earth would appear to be larger than the Sun.
- For the relative sizes of the Earth and Sun to be correct in the reflection, the mirror would have to be as far from Earth as the Earth was from the Sun. But even pointing to a mirror at a distance of the moon would require a very large one, probably more than one hundred kilometers (sixty miles) in diameter.
- A professional astronomer should be able to realize nearly instantaneously that they're not looking at an Earth-like, extrasolar planet (as should anyone, in fact, who is familiar with even the basic arrangement of Earth's continents and oceans), but instead Earth itself.
- A telescope of this size, or indeed any one employing a solid mirror rather than a massive disk of dust in space, could never see an extrasolar planet with this level of detail without insurmountable engineering issues.

#1232: Realistic Criteria

July 01, 2013



I'm leaning toward fifteen. There are a lot of them.

Explanation

Many people are opposed to space exploration. While the overall budget of NASA is not very large compared to the big spenders such as health, education, social services and the military, individual space missions seem very expensive to the general public (typically hundreds of millions of dollars) and the actual benefits derived from them can seem intangible. To put it simply, many people think that the money can be better spent on Earth, where there are real, serious problems that need to be addressed. However, unbeknown to most, NASA not only makes back the money we spent on it (only about 33 dollars), but actually gains several billion dollars. It also provides hundreds of thousands of jobs, and things like GPS, cell phone service, the modern computer, the modern cellphone, and CAT scanner. Pretty good for costing less than a Netflix subscription.

The decision on how to best allocate our money is not a simple one. White Hat believes we should not explore space until "we have solved all our problems here on Earth". This is unreasonable, as the objective is vague, broad and near-impossible to achieve, at least within the span of a human life.[citation needed] The basic problems that face us all - war, disease, hunger, climate change, natural disasters, general malaise - have been with us since the dawn of humanity at least, and will certainly be around for much longer than ten or fifteen years; in fact, it is unclear if some of these problems will ever be solved. As of 2025, twelve years after this comic, it seems

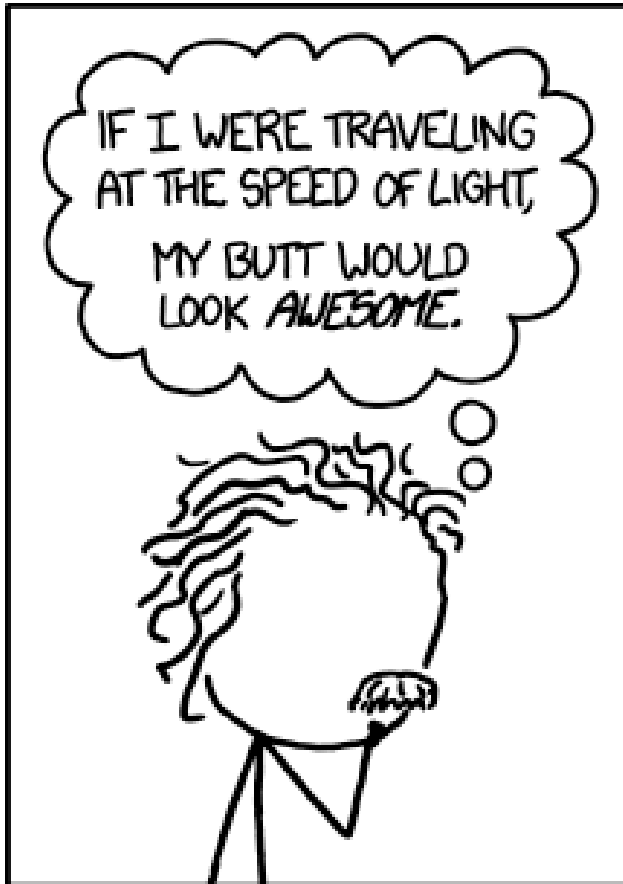
humanity has rather created more problems than it solved. Let's hope humanity can achieve the goal by 2028 then.

Cueball, however, is playing the naive engineer, thinking that everything is as easy and simple as the math problems he uses everyday. Alternatively, he could be replying sarcastically, knowing that there is no timeline for solving all of Earth's problems. This serves two purposes: First, it highlights the untenability of White Hat's statement by emphasizing their size, and second, it serves as a punchline, as anyone with a modicum of common sense knows nothing is that simple when humans are involved.

In the title text, Randall leans towards fifteen years, as ten doesn't seem sufficient given all the problems, once again humorously implying 15 years would be sufficient to solve everything. This also may be said by Cueball, or White Hat replying to Cueball.

#1233: Relativity

July 03, 2013



EINSTEIN WAS FAMED
FOR HIS GEDANKEDANK.

It's commonly believed that Lorentz contraction makes objects appear flatter along the direction of travel. However, this ignores light travel times. In fact, a fast-moving butt would appear rotated toward the

observer but not substantially distorted. Shakira was right.

Explanation

Gedankedank is a humorous portmanteau of Gedankenexperiment (German for "thought experiment") and badonkadonk (slang term for an attractive, round butt).

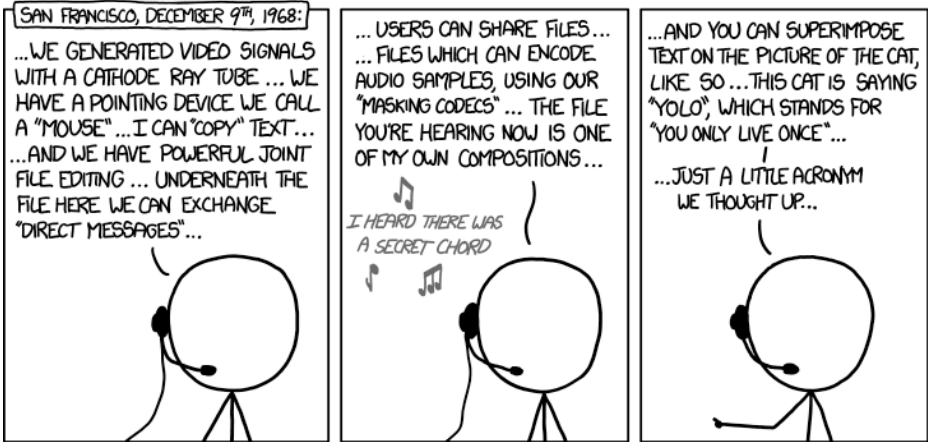
Albert Einstein often used thought experiments to explore scientific hypotheses too impractical or impossible to actually perform, in order to examine their consequences. Moving close to the speed of light, c , is nigh-impossible with existing technology; and according to Einstein's theory of special relativity accelerating a mass exactly to c is impossible. Einstein is well known not to have cared about his appearance (e.g. his uncombed hair, the tongue photo, etc.) so it is unlikely that he pondered how relativistic velocity would affect the appearance of his butt.[citation needed]

Lorentz contraction is a consequence of special relativity, whereby objects contract in the direction of travel.

The appearance of rotation while moving close to the speed of light is known as Terrell rotation. The title text then connects this rotation to the Shakira song "Hips Don't Lie".

#1234: Douglas Engelbart (1925-2013)

July 05, 2013



Actual quote from The Demo: '... an advantage of being online is that it keeps track of who you are and what youre doing all the time ...'

Explanation

The comic describes and references the engineer Douglas Engelbart's computer demonstration *The Mother of All Demos* in honor of Engelbart, who died on July 2, 2013.

The demo is renowned for the numerous technologies Douglas' team introduced, which the comic references before sliding into apocryphal claims. In the first panel he presents various inventions, including the computer mouse. The second panel contains the opening lyrics of Leonard Cohen's song *Hallelujah*. The "Secret Chord" is a reference to the "Chord Key Set" that he presented at this demo. This relatively obscure device, essentially a piano with five keys, was meant as an alternative to the well-known keyboard. The way he introduces the song is also a reference to musical demo tapes, in which an artist presents a new piece of original music, tying it back to the *Mother of All Demos* title. The third is a reference to contemporary internet memes, specifically cat pictures and YOLO.

The title text is a reference to recent revelations about spying by the United States National Security Agency, which was making headlines when this comic was published. While it might have seemed like an advantage at the time, in a modern context this aspect of the internet appears disturbing.

The inventions in detail[edit]

Several of the inventions presented by Douglas in 1968 were years

ahead of their time, and many would prove to be very influential in the development of personal computing. Some of the technologies demonstrated found success in the following decades, while others did not.

Although the following technologies were shown in the demo, Munroe's text does not follow a transcript.

Cathode ray tube

Computer mouse

Text movement/cloning

Joint file editing

E-mail

File sharing

Audio codec

Concepts that Douglas did not invent[edit]

From the bottom of the second panel the comic exaggerates the idea that Douglas introduced the future to a hilarious and ridiculous level.

"Hallelujah"

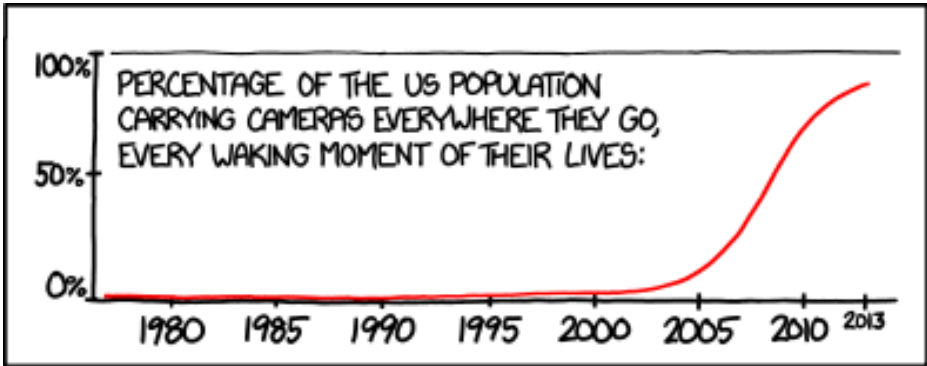
Image macros

LOLcats

YOLO

#1235: Settled

July 08, 2013



IN THE LAST FEW YEARS, WITH VERY LITTLE FANFARE,
WE'VE CONCLUSIVELY SETTLED THE QUESTIONS OF
FLYING SAUCERS, LAKE MONSTERS, GHOSTS, AND BIGFOOT.

Well, we've really only settled the question of ghosts that emit or reflect visible light. Or move objects around. Or make any kind of sound. But that covers all the ones that appear in *Ghostbusters*, so I think we're good.

Explanation

Displayed is a timeline chart showing the percentage of people in the United States who have a camera at every moment. Randall refers to the fact that today most people carry embedded camera devices using their cell phones or the even more modern smartphones.

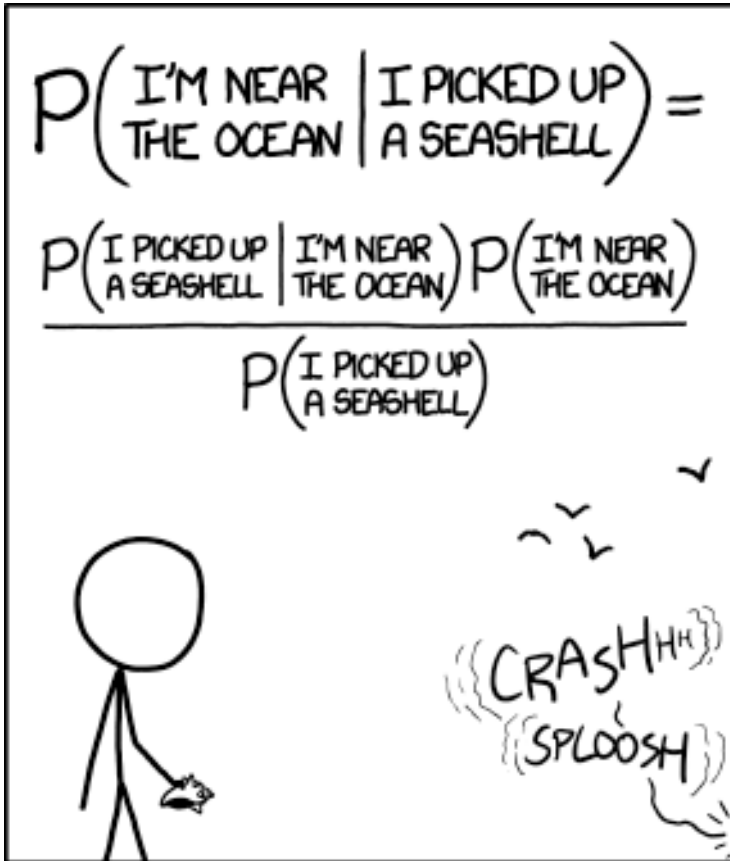
The chart shows that after the 1980s the percentage increases rapidly, almost reaching 100% by 2013. The text below the image states that "We have conclusively settled the questions of flying saucers, lake monsters [such as the Loch Ness Monster], ghosts, and Bigfoot", implying that because almost everyone carries a camera the evidence should have arisen by now to settle any question about such phenomena. Of course, such evidence has not arisen — but that doesn't stop many people from continuing to believe the myths. But at least now it is hard to claim that you saw something, but didn't have a camera to capture it with. If something moved by so fast that you did not have time to take a picture, then it could also be questioned if you have time to see that it was a ghost etc.

The title text declares that, in the case of ghosts, only the questions regarding phenomena that can be captured with a camera have been settled - leaving, in other words, ghosts that can't be seen, heard, or felt are essentially indistinguishable from an absence of ghosts. The title text also makes a joke about the ghosts of Ghostbusters, a popular film that featured highly visible and noisy ghosts

which left a slime. If such ghosts existed, recording them would be very easy.

#1236: Seashell

July 10, 2013



STATISTICALLY SPEAKING, IF YOU PICK UP A SEASHELL AND DON'T HOLD IT TO YOUR EAR, YOU CAN PROBABLY HEAR THE OCEAN.

This is roughly equivalent to 'number of times I've picked up a seashell at the ocean' / 'number of times I've picked up a seashell', which in my case is pretty close to 1, and gets much closer if we're considering only times I didn't

put it to my ear.

Explanation

This method of relating the probabilities of two events is known as Bayes' Theorem.

If you put a seashell up to your ear, you might hear a sound similar to the ocean apparently inside the shell. But the idea that this sound is actually the sound of the sea is just a popular myth: hold only your hands close to your ears and you will hear the same sound, as it is the sound of your blood moving through your blood vessels that causes the sound. The comic, through an application of Bayes' Theorem, points out that most of the time when you pick up a seashell, you are in fact at the beach next to the real ocean, so hearing the ocean at that location is not all that impressive, but it's just real.

The equation should, however, be read as follows: (The probability that I'm near the ocean, given that I picked up a seashell) is equal to (The probability that I picked up a seashell, given that I'm near the ocean) multiplied by (The probability that I'm near the ocean) divided by (The probability that I picked up a seashell).

The title text points out that most instances where the author has picked up a seashell have been at the beach, and nearly all of the times where he has picked up a seashell and not put it to his ear have been there.

This comic was released late. In the first version, the formula was incorrect, but it has since been corrected.

#1237: QR Code

July 12, 2013



HOW TO FREAK OUT A MOBILE APP USER

Remember, the installer is watching the camera for the checksum it generated, so you have to scan it using your own phone.

Explanation

QR codes (quick response codes) are a type of 2D barcode that can be scanned using any of several apps on a smartphone. This comic illustrates installation of a new application that requires the smartphone to scan a QR code on its own screen. There is no conceivable purpose for such a step, so it would be completely silly. Even with two mirrors or a front-facing camera and mirror, most smartphones would be unable to simultaneously display the camera feed for the QR scanner and the QR code itself. The only way to do it would be to take a picture of the QR code with a digital camera and then scan the screen of the camera. The "12 seconds remaining" part indicates that there is a time limit for this, and thus a quick response is necessary.

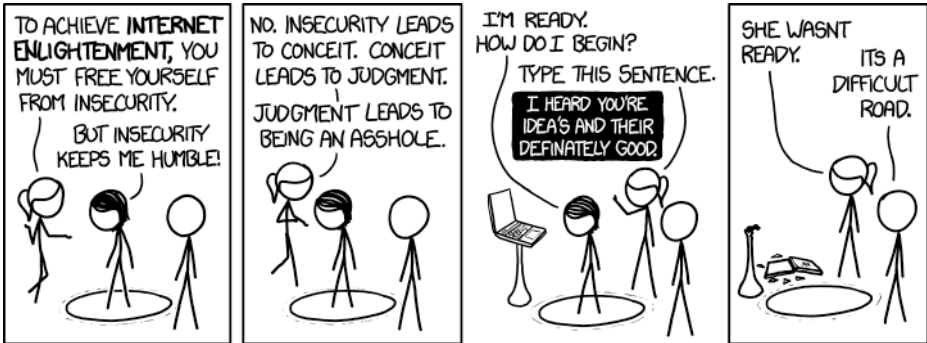
If scanned, the QR code in the comic reads <http://xkcd.com/1237/scan/>, a link to a nearly identical image, but the line above the QR code reads, "To continue reading," and the caption reads, "How to trap a webcomic reader in an infinite loop". The QR code is identical to the previous one. So, if scanned again, it would simply return the scanner to the same image in an "infinite loop".

In the title text, it is revealed that not only is there a time limit, but that the QR code must be scanned using the same phone that's displaying the code. Doing this using the phone's own camera is impossible. The only way to scan the code using the same phone would be by taking a

screenshot and opening it with an app that scans for QR codes in images, rather than using the camera. While such apps do exist, most smartphone users would have no need for such an app and are unlikely to have one installed on an older phone, but for quite some time both iPhone and Android phones come with a built-in QR code scanner that can scan images from the gallery. This does not prevent this particular instance from still confounding the user, e.g. by the swapping away from the screen with the code restarting the process from scratch, and/or taking longer than the time given to complete the 'scan' and return back at this point in the process.

#1238: Enlightenment

July 15, 2013



But the rules of writing are like magic spells. If you never acquire them, then not using them says nothing.

Explanation

This comic is a reference to a scene one might imagine in Star Wars Episode I: The Phantom Menace in which Yoda expresses doubt in a young Anakin's potential to join the Jedi order. Yoda delivers a speech similar to the one that Ponytail gives here, except that the end of the sequence he presents is "the dark side" instead of "being an asshole". Yoda is ultimately correct; Anakin's fears lead him to join the dark side so that he may keep his loved ones from dying; this is at the expense of the stability of the galaxy, however, and his actions are in vain, as his wife dies nonetheless. The circle on the ground is also taken from the Star Wars scene, and Cueball is presumably in the Mace Windu role.

Here, Randall compares Anakin's decision to join the dark side to the propensity of many Internet commenters to correct others on their spelling and grammar, and to the extreme prevalence of criticism over commendation or confirmation. Randall's point is that correcting people, like joining the dark side, ultimately stems from insecurity.

Ponytail and Cueball challenge Megan to type the sentence "I heard you're idea's and their definately good", which contains four common misspellings (you're instead of your, idea's instead of ideas [see greengrocers' apostrophe], their instead of they're, and definately instead of definitely), which means probably as defined in 2871: Definitely, and a misapplied verb ("heard"

instead of "read").

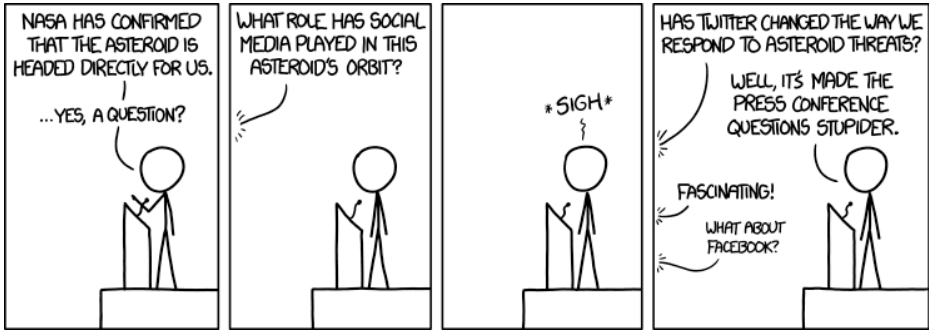
Regarding the content, this sentence is one that is highly unlikely to be ever read in an internet argument, as almost every time people still have things they claim to know better about.

Megan thus can't bring herself to type this sentence, having spent so much time judging others for their trivial errors, even when they're saying helpful things like the sentence in question. Instead, it is strongly implied that she smashes the computer and runs away — demonstrating the sort of anger that "Grammar Nazis" and internet wiseacres like her can feel about punctuation and spelling errors, and about content-related errors respectively. Cueball and Ponytail remark on this, both failing to use apostrophes.

The title text refers to Terry Pratchett's novel *Equal Rites*, in which the characters discover that the most powerful magic is not using magic — with the distinction that not using magic because you don't know how is not the same as choosing to refrain from using magic when you do know how. Randall is comparing this with use or misuse of the rules of Standard English: not even knowing the rules is not admirable, whereas knowing the rules but choosing to disregard them is. There is also a double meaning - not writing anything at all is in fact "saying nothing".

#1239: Social Media

July 17, 2013



The social media reaction to this asteroid announcement has been sharply negative. Care to respond?

Explanation

This comic parodies how journalists tend to focus on social networking. Specifically in the case of revolutions, social media is given a lot of weight, even in countries with limited internet access. A direct parallel is made to the so-called Twitter Revolutions.

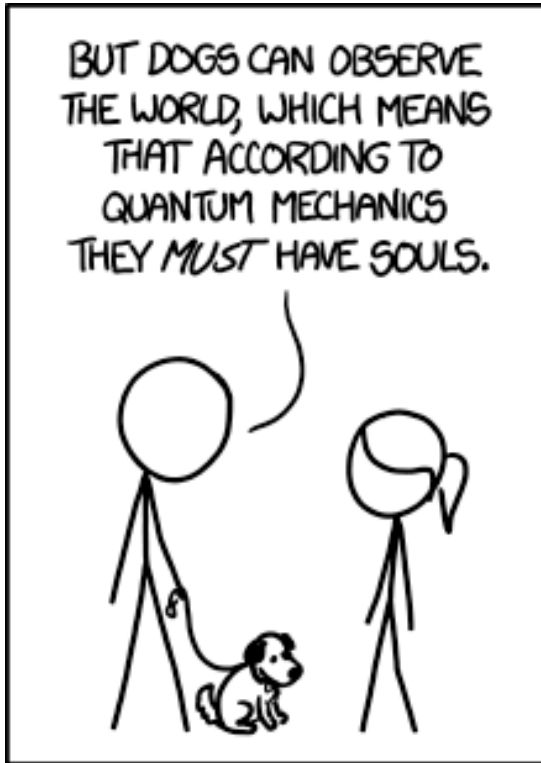
On Twitter you can send text messages with a maximum of 280 characters (140 at the time of writing). This means that there could not be much content in a single post, but often many people follow the people doing these tweets. People who are not on social media tend to react like Cueball and come to the conclusion that Twitter makes press coverage more stupid, just because those messages lack much detail. Cueball is also surprised about the stupidity of trying to link social media to the orbit of the asteroid — social media has no impact on the orbit of any space objects.[citation needed]

The title text continues the joke. The negativity on Twitter concerning an Earth-bound asteroid has nothing to do with the press conference that announced it but rather with the negativity of wiping out life on earth in general. Again, journalists give undue weight to social media.

It's simply that "How has Twitter affected this" has become a standard question for journalists, posed in complete disregard of the actual event.

#1240: Quantum Mechanics

July 19, 2013



PROTIP: YOU CAN SAFELY
IGNORE ANY SENTENCE THAT
INCLUDES THE PHRASE
"ACCORDING TO
QUANTUM MECHANICS"

You can also just ignore any science assertion where 'quantum mechanics' is the most complicated phrase in it.

Explanation

This comic plays with the fact that quantum mechanics is a very complex subject that is frequently misapplied by laymen. Many of the phenomena studied in quantum mechanics are contrary to common sense and can only be expressed in complex mathematics. Yet, since the field is fundamental to our understanding of reality, it is commonly cited to support broad sweeping philosophical generalizations.

The phrase “according to quantum mechanics” betrays the speaker's lack of knowledge about the subject. To a physicist, it is almost as vague as “according to physics”. Somebody who understands the subject would use a more precise term, such as “according to the uncertainty principle” or “according to a paper by such-and-such.”

Cueball explains to Ponytail that dogs must have souls. This would be against the doctrine of certain religions, including some sects of Christianity, which teach that only humans have souls. The question of whether animals have souls comes up for many reasons in theological and philosophical discussions. One major one is the wish of many Christian dog owners to meet their pets in Heaven. In many Christian doctrines, this would require dogs not only to have souls, but also immortal souls. This distinction comes up in Catholicism, for example, where the commonly taught doctrine, as in Aquinas, S.C.G. II, C. 82, is that, while animals do have souls, their souls are mortal, and therefore die with their

bodies. In this case, animals cannot enter Heaven, Hell, or Purgatory.

Cueball, however, uses quantum mechanics as an argument, even though quantum mechanics is only applicable on the atomic scale and not on macroscopic objects like animals. It also only applies to matter and energy, and not to souls, which are held by most doctrines to be immaterial. His argument, however, is a reference to the concept of an 'observer' in quantum physics, as well as theories about the collapse of wave functions. It should also be noted that science does not equate the ability to observe the world and possession of a soul, and that the latter is merely a theological concept, not used in science and not proven to exist in real world.

The vast majority of people do not have a sufficient understanding of quantum mechanics to judge whether Cueball's statement is correct. Nevertheless, Randall's message is: you don't need to understand quantum mechanics to judge the statement. No matter what the sentence is, it is almost certainly incorrect, so "you can safely ignore" it.

The title text refers to "science assertions" — that is, claims about scientific knowledge — that include the words "quantum mechanics". If "quantum mechanics" is the most complicated term in the sentence, then the speaker probably does not know what they are talking about. If a scientist is correctly applying quantum mechanics, they will use more specific (and hence more complicated) language.

#1241: Annoying Ringtone Champion

July 22, 2013



BY UNANIMOUS DECISION, THE WINNER
OF THE AWFUL RINGTONE CHAMPIONSHIP
IS "THE SOUND A MOSQUITO MAKES
AS IT BUZZES PAST YOUR EAR"

It beat out 'Clock radio alarm', 'B-flat at 194 decibels', 'That noise from *Dumb & Dumber*', and 'Recording of a sobbing voice begging you to answer'.

Explanation

This comic satirizes the large variety of ringtones that may be used on their cell phones. While many are simply tunes that personalize a user's phone, some will use ringtones that resemble everyday sounds, such as doorbells, coughing, alarm noises, or in this case, the buzzing of a mosquito. Although rather innocuous, these ringtones can get very annoying to some people, which is what this comic is getting at.

Here, Black Hat has set his ringtone to "The sound a mosquito makes as it buzzes past your ear", the winner of the "Awful Ringtone Championship". Cueball, hearing the sound, cries out and swats the air around his head, mistaking the ringtone for an actual mosquito buzzing past his ear. In addition to being an extremely unpleasant sound, it could also cause confusion to others, as shown in the comic, thus being unanimously decided as the most annoying ringtone. Black Hat's response is likely a pun meaning both "Oh, I've got to take this [call]" (like someone who has been interrupted by a phone call) and need to leave and respond and "Oh, I've got to take this [competition]" since the ringtone is so annoying.

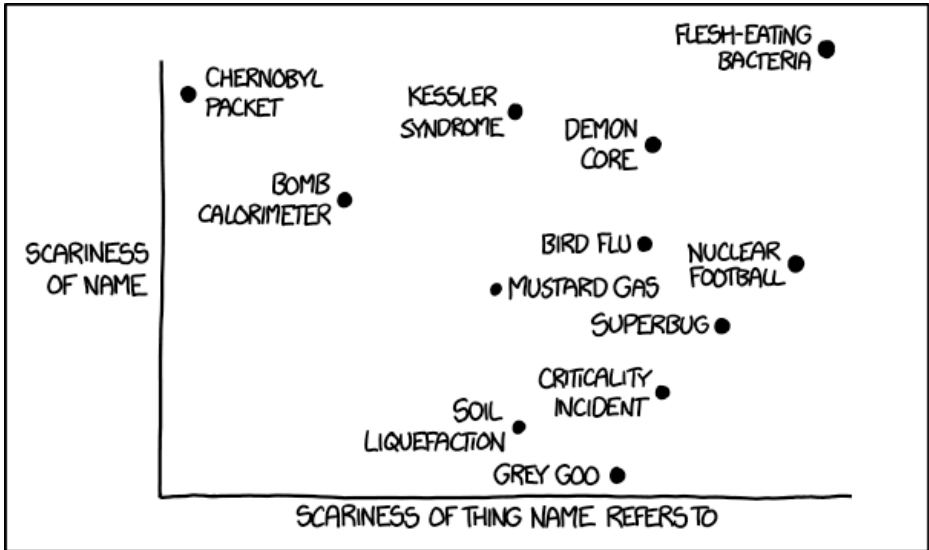
The title text refers to four other annoying ringtones, apparently none of which were deemed as annoying as a mosquito buzzing:

- "Clock radio alarm". These sounds are often loud and annoying, just to ensure that you really will wake up.

- "B-flat at 194 decibels". B-flat is a musical note with a pitch of 466.16 Hz (or any power of 2 or 1/2 multiplied by that). 194 decibels is 501187233627% (most devices only go up to 100%/0dB) and is the limit at 1 atmosphere pressure. Any more energy would create a shockwave. This could also be a reference to a crowd of vuvuzelas as they also produce sounds pitched around B flat. This may also refer to several B-flat-related phenomena discussed in an NPR story, Have You Heard About B Flat? Specifically, B-flat has been found to agitate alligators, and waves passing through gas near a black hole have been found to resonate at a frequency which results in a B flat 57 octaves below middle C. Regardless of all this, a sound played as loud as 194 dB is quite literally deafening, so the ringtone would be not so much annoying as dangerous, which would probably have it disqualified from the competition.
- "That noise from Dumb & Dumber". Dumb and Dumber is a comedy movie from 1994. The noise from Dumb & Dumber is referring to the point in the movie when Harry and Lloyd asked, "Do you want to hear the most annoying sound in the world?" and began shrieking in imitation of a loud fax machine.
- "Recording of a sobbing voice begging you to answer". Self-explanatory. Such a ringtone is obviously disruptive, annoying, and potentially worrying to those in the vicinity of the phone.[citation needed]

#1242: Scary Names

July 24, 2013



Far off to the right of the chart is the Helvetica Scenario.

Explanation

This chart humorously explores how things are often named colloquially and without regard to accuracy in correlating actual scariness with apparent scariness. It is interesting to note how people react to the items near the bottom right of the chart "scary things with not-very-scary names" when compared to how they may react to items in the upper left "not-very-scary things with scary names". Some of the entries on the chart are especially interesting examples considering that portions of the names that are associated with significant historical or cultural events and themes. i.e. Chernobyl Packet, Demon Core. All items are described in the table below including the title text on Helvetica Scenario.

On the chart, things toward the right are scary/dangerous/very bad, while things toward the top sound scary without necessarily being scary.

Note that Randall uses similar diagrams in both 388: Fuck Grapefruit, 1501: Mysteries and 2466: In Your Classroom, which also contain different items. The first two also have an extra point, and the last two extra points mentioned in the title text. Only the first and the last comics points are also off the chart, whereas for the second the description of the point is too long to fit on the chart. Extra info outside the chart is also used in the title text of 1785: Wifi, but this is a line graph.

Table[edit]

- This table list the entries from least to most scary, including the entry mentioned in the title text.
- To begin with it is sorted from most scary name to least scary name.

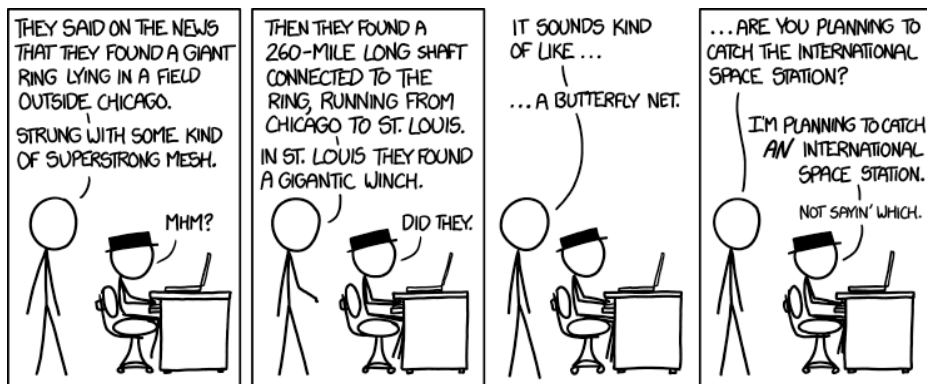
The assigned percentage values assumes a linear scale and assigns flesh eating bacteria with the point (100%, 100%).

This is simply the easiest way to list the entries as there is no mention of the scale.

As is clear from the title text, "flesh eating bacteria" is not an absolute, simply the highest in this particular sample; there are things more scary than 100%!

#1243: Snare

July 26, 2013



It's going in **A** collection of satellites skewered with pins and mounted in display boxes. Not necessarily **MY** collection.

Explanation

This comic paints another one of Black Hat's evil activities as an unlikely supervillain.

As Cueball states, there have been some strange discoveries in the news including a gigantic ring strung with superstrong mesh, a long pole, and a gigantic winch. As Cueball outlines these items, Black Hat responds casually to each detail, seeming preoccupied with his computer. Cueball realizes that the pole, ring and net combination sounds like a butterfly net, albeit one of immense size. Given Black Hat's history of nefarious activities and the specific length of the pole (260 miles or 420 km, the same as the height of the International Space Station's orbit above Earth), Cueball infers and then accuses Black Hat of wanting to catch the International Space Station (ISS) by winching the pole up so that the Space Station orbit leads it to fly into the net, therefore catching it.

Black Hat does not deny the charge, but he dissimulates by saying it is not necessarily the ISS that he intends to catch, but just an international space station. While his statement implies that it could be targeted at some other international space station, it is transparently obvious which one he is targeting since there's only one international space station in existence.[citation needed] Any international space station that he can catch must be the ISS. (As for non-international space stations, the only one in orbit at the time of the comic's publication was

the Chinese Tiangong-1, which has since deorbited.)

The title text is a reference to how butterfly collections are usually presented. The insects are mounted in glass display cases, each skewered through the body with a pin, and labeled. The text is spoken by Black Hat, who again tries to imply that he is not to blame, as it may not be meant for his collection of satellites. Perhaps he is just catching a space station for a friend (or possibly Danish).

The real buildings may belong to these structures:

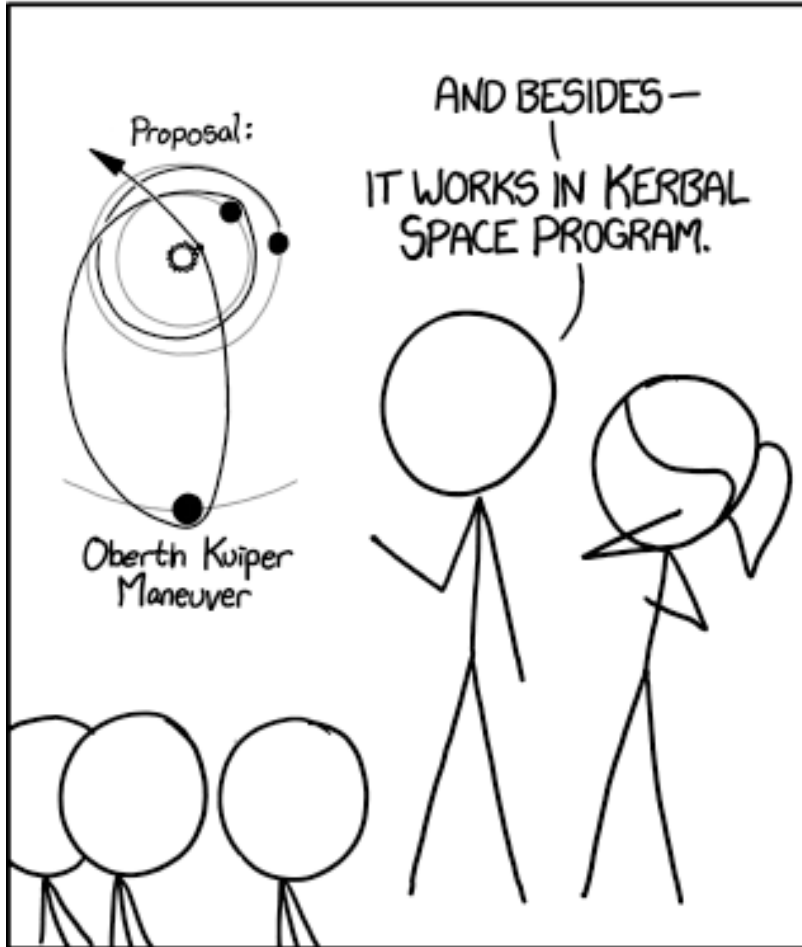
- The giant ring from the first panel may be an allusion to the Tevatron, a former circular particle accelerator at the Fermi National Accelerator Laboratory (Fermilab), east of Batavia, near Chicago, Illinois. It is a 6.86 km (4.26 miles) long ring, giving it a diameter of almost 2,2 km (1.4 miles) leaving plenty of room to catch the ISS which is "only" 108.5 m (356 ft) in the longest direction.
- Similarly, the gigantic winch in St. Louis, may refer to the 630-foot (192 meters) high Gateway Arch monument. It is the tallest man-made monument in the United States.

Even the rough south-north direction of this building does match to this scenario because the Fermilab is approx. 240 miles north of St. Louis. However, it is an arch, not a winch.[citation needed]

#1244: Six Words

July 29, 2013

THE SIX WORDS YOU *NEVER* SAY AT NASA:



Ahem. We are **STRICTLY** an Orbiter shop.

Explanation

The six words are: "It works in Kerbal Space Program".

Oberth maneuvers[edit]

The Kuiper Belt is a region of the outer Solar System beyond the orbit of Neptune consisting of numerous small icy bodies, including the dwarf planets Pluto and Eris. An Oberth maneuver is a spaceflight maneuver, specifically an engine burn performed during the flyby of a celestial body. The point of this is to optimize usable energy, because rocket burns are more effective to perform at high speeds than at low speeds. The more massive the body and the lower the altitude, the higher the flyby speed will be, and the greater the performance gain due to the Oberth effect. The theoretical way to use rocket fuel most efficiently is therefore to execute the burn during a flyby of the most massive celestial body available, as close as possible.

Cueball is proposing to implement an "Oberth Kuiper Maneuver", and the proposal diagram shows the spacecraft using gravity assists to travel first towards (presumably) Venus for a first boost, then towards Jupiter for another swing by, aiming it back towards the Sun, the most massive Solar System body, to perform an Oberth maneuver at the point of closest approach, as indicated by a small dot along the spacecraft trajectory. It is possible that the diagram might only be a simplified outline of a more complex flight plan. For example, the trajectory from Earth to Venus would require two separate burns in deep space. The first burn would occur immediately after escaping Earth's sphere of influence. The second burn would occur about halfway to Venus. Alternatively, Cueball may have gotten it wrong, or Randall may

simply not have concerned himself with such things for the purpose of a webcomic sketch.

An Oberth maneuver in the close vicinity of the Sun, while theoretically possible and extraordinarily effective at the speeds the spacecraft would reach, would however be very difficult to carry out in real life, because the neighborhood of the Sun is an extremely hostile environment[citation needed] and the spacecraft could be incinerated during a too-close flyby.

Kerbal Space Program[edit]

Cueball's argument for why the maneuver will work in real life is that it works in Kerbal Space Program (KSP), a sandbox spaceflight simulator game. While KSP does simulate a lot of the physics of space flight, it is (necessarily) simplistic in its modeling of orbital dynamics. For example, KSP does not do any N-body simulations, so if one were flying a rocket from Earth to the moon, in the game the rocket would only be affected by Earth's gravity until it reaches a certain point where it will only be affected by the moon's gravity, unlike in real life where the rocket would feel the effects of both celestial bodies at all times. Therefore, orbits modeled using KSP would poorly reflect the actual orbital behavior of a probe traveling through the solar system on a multi-year mission involving multiple fly-by maneuvers.

Another reason why using KSP would not inspire confidence is that many players playing the game use a 'trial-and-error' method, field testing designs and inevitably either crashing them or running out of fuel stranding the craft in deep space. Inside a game this is not a major issue as one can simply reload an earlier

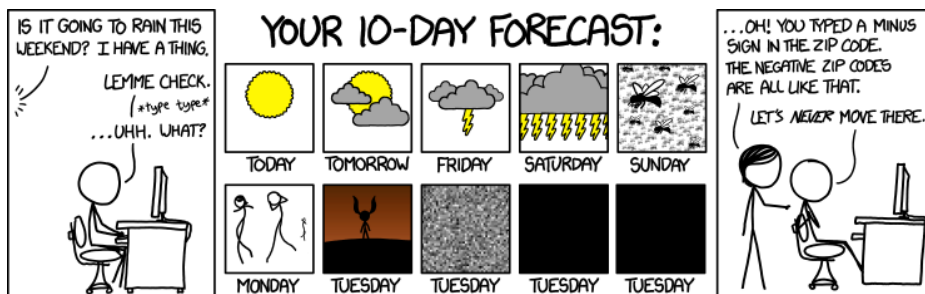
save with no repercussions, but in real life this would result in expensive costs constructing new spacecraft and even loss of human life, which NASA would likely frown upon.[citation needed]

The humor in referencing KSP in the comic lies in using a simple game program to simulate complex space missions which in reality take a great number of experts to plan and implement. Fly-by maneuvers, used to minimize the fuel needed to reach a destination, need to be very carefully timed - often to within seconds - so the use of Kerbal Space Program to simulate them isn't a good enough argument for NASA to agree to implement the proposal, and implies simplistic thinking on the part of the proposer; therefore one should not say it at NASA.

The title text refers to Orbiter, which is another spaceflight simulator program. The title text suggests that the argument doesn't work for NASA, not because it's not scientifically sound, but because NASA relies on the Orbiter simulator rather than the Kerbal simulator (although the proposed maneuver would appear to work in both).

#1245: 10-Day Forecast

July 31, 2013



Oh, definitely not; they don't have Amazon Prime.

Explanation

A 10-day forecast is a prediction of the weather extending 10 days into the future. Due to the chaotic nature of weather systems, the accuracy of forecasts decreases drastically the further ahead you try to predict.

When Cueball checks the forecast for his local area, it starts off predicting normal sunny weather, but quickly devolves into progressively extreme lightning storms, then a plague of insects which appear to be locusts, what appears to be The Rapture, and the appearance of a demon-like creature. Upon the arrival of the creature (perhaps The Antichrist or Woden) appearing, the forecast falls into static and nothingness with the day stuck on Tuesday, implying that the world has ended.

When asked about this, Megan casually explains that Cueball put a minus (-) sign in front of his ZIP code. A ZIP code is a numeric postal code used in the United States. As ZIP codes are tied to a geographic location, it is also often used as an easy way for people to specify their local region for the purposes of weather reports.

Many computer systems that allow the user to enter a number have a range of applicability, such as positive numbers only. If the user enters a number that doesn't make sense, then the system must somehow deal with this number. Common ways to do this are to simply disallow the user from entering invalid numbers, or to return an error condition if the entered number is

invalid. However, if the system has not been given any way to deal with an unexpected number, it will simply use it, which can result in unpredictable or erroneous behavior, such as accessing or overwriting unintended locations in memory.

When this kind of anomaly occurs in video games, particular older ones such as those on the Nintendo Entertainment System, it can result in levels being created from arbitrary data, producing a corrupted, physically-impossible (yet sometimes playable) level; this is popularly known as a "Minus World". Because the level can be reproduced by using a particular invalid value, it is in some sense true to say that the level "exists" within the game, even though it was not intended.

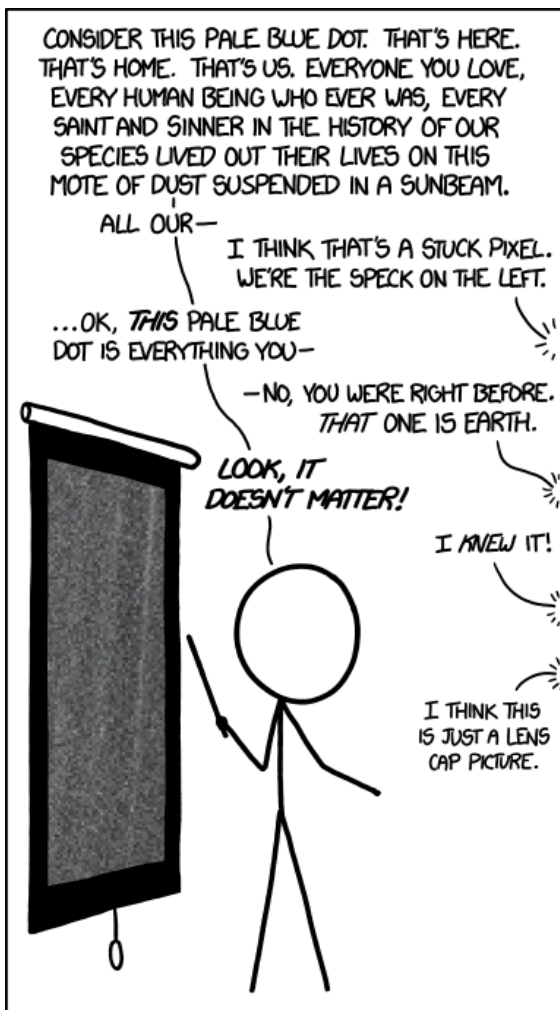
In the comic, the joke is that somehow, "minus zipcodes" do exist, and do correspond to physical locations - but, by analogy with Minus Worlds in video games, are bizarre and incomprehensible places compared to the regular zip codes.

In the title text, Megan agrees with Cueball's desire not to move to that ZIP code area, the punchline being that her reason isn't to avoid the apocalypse, but to retain access to Amazon Prime, which shows that her priorities are amusingly bizarre. The service Amazon Prime is provided by Amazon,[citation needed] where the user pays a flat annual fee and in exchange they get access a number of "enhanced" Amazon services, including free two-day shipping, free access to a library of streaming videos, and the ability to borrow books.

Later, a Five-Day Forecast was also made into a comic.

#1246: Pale Blue Dot

August 02, 2013



Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves. There is no road out of this oblivion; we must

embrace it. We must join with the darkness. Ba'al the Annihilator offers us no happiness, no answers, naught but the cold embrace of the void. To imagine any other end is delusion. We must give in to the will of Ba'al, for he will one day consume us and our world alike. I therefore call on Congress to fully fund space exploration, and to join with Ba'al, the Eater of Souls. Thank you.

Explanation

The Pale Blue Dot is a picture of the Earth taken in the year 1990 by the Voyager 1 space probe at a distance about 6 billion kilometers (3.7 billion miles). It was part of the Family Portrait, a series of images of the entire Solar System from beyond it.

The picture was taken at the request of Carl Sagan, a well known space scientist at that time. In 1994 Sagan wrote the book "Pale Blue Dot: A Vision of the Human Future in Space" inspired by this picture. In the book, Sagan waxed eloquent about the picture in a widely quoted passage. The complete passage can be found in Wikiquote, and you can hear Carl Sagan himself reciting it in this YouTube video.

Cueball quotes from a condensed version of this passage until he is interrupted by several hecklers who begin an argument over which speck in the picture is actually the Earth. Then, when Cueball cries out in exasperation that it doesn't matter, one heckler takes it the wrong way and points out that he just said that the picture doesn't matter. This pokes fun at the fact that the Pale Blue Dot picture has very little to no visual attractiveness, apart from the intellectual interest relying on the viewer's knowledge that the central speck is actually our home planet, Earth, seen from a very great distance.

Another Heckler says that the photo is a "lens cap". This is a reference to the missions where the lens cap was not

removed and the resulting photos were black.

The first two sentences of the title text are also a quotation from Sagan's paean to the Pale Blue Dot picture, but then the text veers humorously into non-scientific mysticism that starkly contrasts with the attitude and intent of the original work.

The title text evokes Cosmicism, a philosophy developed and exemplified by the fictional Cthulhu Mythos. This Mythos is expounded in fantasy/horror works of H.P. Lovecraft and, later, August Derleth, and features a cosmology in which humanity is depicted as inconsequential within a greater existence that is unknowable and frightening. Cosmicism asserts that humanity is doomed to death and destruction through the workings of vastly more powerful supernatural forces way beyond our understanding. There are many instances in the fiction of H.P. Lovecraft of factions that embrace the destruction of humanity and actively work towards bringing about that end through the invocation of the unknowable and powerful forces that supporters of Cosmicism believe surround everything.

The text also references Ba'al, originally a Semitic deity that members of other religions have since associated with demonic or otherwise evil forces. The name Ba'al, and other variants of the same, has been included in many other fictional works often as a villain or antagonist – for example, the fictional System Lord Ba'al from the television show *Stargate*. The title text supplants all of the supernatural forces associated with Cosmicism in the

works of other authors with Ba'al. Cueball, who continues his discourse in the title text, may be acting as a Cosmicist and is calling on a Congress, to which he is speaking, to fund the space exploration program as a means to join with Ba'al, the Eater of Souls. The fact that a Ba'al cultist would be speaking in front of a government body in such a manner is absurd[citation needed] and thus hilarious.

Ba'al, the Eater of Souls (sometimes as Ba'al the soul eater) has been mentioned later in 1419: On the Phone and 1638: Backslashes.

The actual Carl Sagan (or perhaps a hapless namesake) was later seen reciting the words in 2906: Earth. In that case he seems to be mostly uninterrupted, though his audience may have just run out of objections and recriminations by the time he resorts to the rhetorical flourish.

#1247: The Mother of All Suspicious Files

August 05, 2013



Better change the URL to 'https' before downloading.

Explanation

Modern operating systems try to intercept malicious files before they can be downloaded. This comic depicts a dialog box requiring the user to confirm if they want to download a potentially dangerous file — and it turns out the file being downloaded is absolutely filled with a truly absurd number of file extensions. Many of the extensions used inside there indicate executable code; multiple file extensions are sometimes used to disguise a trojan program as a document. The sheer number of extensions in the comic wouldn't just look out of place on a safe file, it's also far more than an actual computer virus would bother to have, thus the humor.

The first part of the suspicious file's name is `http://65.222.202.53`, an IP address that hosted JavaScript malware during a recent attack on the Tor anonymity network, with a very long file title.

You can also see common download syntax for a pirated movie, Hackers, likely included to appear malicious to anyone skimming but is actually a movie about hackers, making it a benign reference rather than malicious. It is described as "`_BLURAY_CAM`", which contradicts itself ("`_BLURAY`" would imply it was ripped from a copy on Blu-ray Disc, while "`_CAM`" would mean it was copied by pointing a camera at the screen in the cinema). "`_BLURAY_CAM`" would probably indicate a search-keyword-stuffed fake copy; fake pirated media often contain viruses (although this is more likely to be a

problem with newer media, before the first real pirated copy appears).

The URL contains the path "`~/tilde/pub/cia-bin/etc`". The first part is a public folder of a user named "tilde" (which is also the name for the `~` symbol), "`cgi-bin`" is a common folder on a web server for server-side executables (Randall changes the name to "`cia-bin`"), and "`etc`" is a standard folder for configuration files – normally never accessible through a web server. The program "`init.dll`" isn't executable at all, it's a Dynamic-link library which can't be run standalone, and is rarely referenced in URLs (even though such syntax is still being employed, even on reputable websites (Google search) or here at eBay, indicating the webserver is a Microsoft ASP server). The question mark indicates the start of a parameter list, and in this case we have only one named "`FILE`".

The "Save" button is greyed out, suggesting that it is disabled; you can click only the "Cancel" button. For security reasons, some browsers (like Firefox) disable the "Save" button for a few seconds before enabling it. This prevents users from accidentally accepting a download while entering input, like a malicious CAPTCHA.

The complete content sent to the server, starting with "`/~/tilde...`" and ending with "`...out.exe`", is exactly 256 characters long. On HTML 3 specifications you have a limitation of 1024 characters, whereas later HTML specifications don't have this limit; it just depends on the web server's capabilities. But posting parameters directly

at the URL is still a worse choice.

The content of the parameter is shown here:

- `__` (underscore underscore) — used in the C programming language to denote that a symbol is really not for public consumption.
- `autoexec.bat` — a batch file which is automatically run during startup on MS-DOS and Windows operating systems, and was often modified by viruses, which added malicious code to be run on each boot.
- `My%20OSX%20Documents` — referencing Apple's OS X operating system (%20 is a representation of a space in a URL, i.e. it reads as "My OSX Documents").
- `install.exe` — a typical installer.
- `.rar` — a compressed archive file type.
- `.ini` — a configuration file type.
- `.tar` — a file archive popular in Unix and Unix-like operating systems. tar has been mentioned before.
- `.docx` — .docx is an Office Open XML file, i.e. a word processing format used by Microsoft Word 2007 and above, but has no cedilla (,). The addition of a cedilla may be a reference to exploits that rely on rare characters being mistaken for more common ones that look similar, such as the IDN homograph attack.
- `.php.php` — a play on PHP files, a kind of server-based web page file type. PHP originally stood for "Personal Home Page" but was later redefined as the recursive abbreviation "PHP: Hypertext Preprocessor".

- .xhtml — another web page file type.
- .tml — stands for Transducer Markup Language, an XML-based markup language that specifies how to capture, time-tag and describe sensor data.
- .xtl — possibly a play on XHTML.
- .txt — a play on .txt file types.
- 0DAY.HACK — a reference to a zero-day exploit. (overlaps with the next entry)
- HACK.ERS_(1995)_BLURAY_CAM-XVID — a reference to the 1995 Hackers movie (previously referenced in 689: FIRST Design, and later in 1337: Hack), but pirated movies would either be a BLURAYRIP/DVDRIP or CAM, but not both at the same time unless you used a camera to record a Blu-Ray movie as it played. Xvid is a particular video codec, originally commercial, which may require specific support to produce or to play. It is not unusual, in certain circles, to include the codec in use in media file-names in order that favored (or unfavorable) ones can be chosen specifically to download (or not).
- .exe — an executable file type used by Microsoft Windows.
- [SCR] — a tag used by movie pirates to denote a 'Screener', the DVD copy of films given to critics prior to theater release. Usually the highest quality available at the time, rare, and thus good bait for a virus-laden download. ".scr" is also the extension for screensaver files, really just an exe file with a different extension and one of the classical ways to distribute infected files.

- Lisp — programming language.
- .msi — an installation file used by Microsoft Installer.
- .lnk — an extension used by Microsoft Windows for shortcuts. The extension is normally hidden to the user.
- .lnk.zda.gnn — references to Link, Zelda, and Ganon, important characters from The Legend of Zelda video game franchise.
- wrbt.obj — A reference to the line of code Dennis Nedry used in Jurassic Park to shut down key systems.
- .o — The extension for a linker file, an intermediary created when compiling C code.
- .h — The file extension of a header file in C code.
- .swf — Shockwave Flash file type.
- .dpkg — The Debian package management, although the package files use the file suffix .deb.
- .app — an application on the Mac OS X operating system.
- .zip — compressed archive file type.
- .co — the top-level domain (TLD) for Colombia, but marketed as a global domain. Some countries use .co.TLD for general use, e.g. .co.uk in the United Kingdom. But the TLD .gz does not exist and thus .co.gz is invalid.
- .gz — a compressed file using GNU zip.
- .a.out — Default filename when creating an executable on Linux or other Unix-like operating systems if none was specified for the compiler.

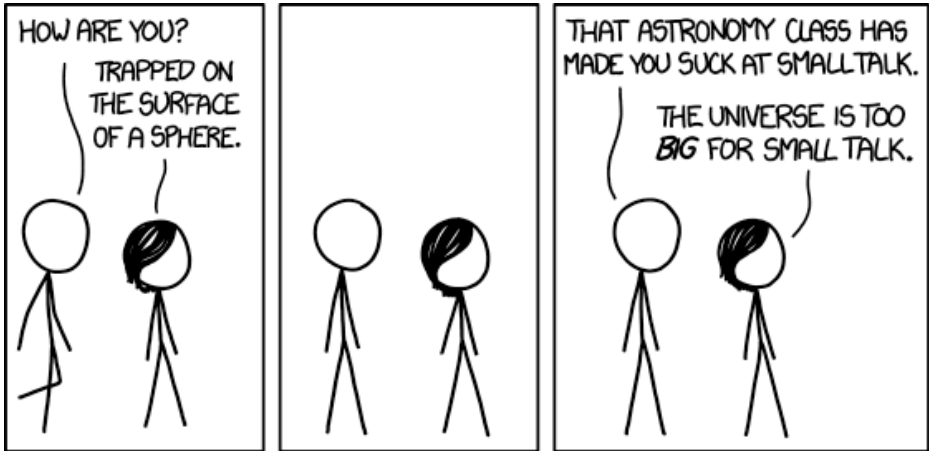
The title text suggests changing from http to https, as if encrypting a suspicious file before downloading it is somehow better than downloading it unencrypted. http (Hypertext Transfer Protocol) and https (Hypertext Transfer Protocol – Secure) are the two common protocols for getting web pages and web downloads. http is the simple download, whereas https adds an SSL encryption layer so the item being downloaded cannot be viewed unencrypted by anyone except the end recipient. Changing http to https is a common suggestion to improve security when browsing the web from an insecure network (such as a public WiFi hotspot) to avoid surveillance or hijacking to a malicious website; Google automatically switches to https for all mail accounts and is starting to do so with searches. The end recipient will still get whatever nasties were in the original, however — encrypting it doesn't change the content at all.

The IP address referenced in the comic, 65.222.202.53, was, at the time this article was authored, being used by the shellcode of a JavaScript zero-day exploit for the Tor Browser Bundle being run by the FBI to phone home over the clearnet and deanonymize visitors to websites on Freedom Hosting that are serving child pornography.

As the last extension in the file is .exe, a Windows computer would run the file like an application. Usually, it is not safe to run unknown .exe files.

#1248: Sphere

August 07, 2013



This message brought to you by the Society of Astronomers Trapped on the Surface of a Sphere.

Explanation

Megan has taken or visited an astronomy class and has become more conscious and aware about the colossal size of the universe, and our own minuscule place in it. She ponders that she can only observe and learn about the rest of the universe; she cannot explore it directly as she is trapped, probably by the constraints of our gravity well, time and human technology.

The sphere she mentions here is the Earth, whose surface is roughly spherical in shape. The figure of the Earth is an irregular shape which can be better approximated as an oblate spheroid, or more specifically as a geoid.

Her disinclination to make "small talk" with Cueball is a reference to how astronomers and people of other 'big-science' specializations can be so focused on their topic that they become disconnected from the simple details of everyday life. This has also been touched upon in 663: Sagan-Man and 786: Exoplanets.

The concept of "small talk", which is usually used as a colloquial term meaning insignificant chatter with others, is taken quite literally by Megan to be small in size. The word itself is juxtaposed with the size of the universe shortly after, which also ties into her previous sentence of being trapped on a "sphere". It seems that astronomy, which deals with ideas of a vastly large scale, has expanded Megan's views to the point where she feels insignificant herself, as well as other matters that concern

her. Her gaze outwards also reinforces this suggestion, especially during her conversation with Cueball. She does not engage in eye-to-eye contact, instead replying without looking directly at him. This implies that she is disregarding the current conversation as insignificant as well, which furthers the assumption of Megan's expanded scope of viewpoint.

The title text is a continuation of this theme. The name "Society of Astronomers Trapped on the Surface of a Sphere" or, "SATSS", follows a common naming practice for scientific communities, Society, or Association, or Union of <Scientists> of <Country, Nationality, or What Ever>.

#1249: Meteor Showers

August 09, 2013

THE XKCD GUIDE TO METEOR SHOWERS

NAME	PEAK	NOTES
QUADRANTIDS	JANUARY 4 TH	BRING PETS INSIDE DURING PEAK ACTIVITY
TRICUSPIDS	JANUARY 21 ST	NOT VIEWABLE IN REGION 2 COUNTRIES
CENTAURIDS	FEBRUARY 6 TH	TOO FAINT TO SEE WITHOUT GOING OUTSIDE
BETA AQUARIIDS	FEBRUARY 10 TH	INVERTED SHOWER CONVERGES TOWARD AQUARIUS INSTEAD OF RADIATING AWAY
CHELYABIDS	FEBRUARY 15 TH	ONLY ONE METEOR PER SHOWER, BUT IT'S BIG.
LYRIDS	APRIL 22 ND	METEORS SOMETIMES SCREAM
DAYTIME ZETA PERSEIDS	JUNE 9 TH	LIKELY A NASA HOAX
JUNE BOÖTIDS	JUNE 27 TH	50/50 MIX OF METEORS AND SHOOTING STARS
SOUTHERN DELTA AQUARIIDS	JULY 19 TH	METEORS VERY BRIGHT, BUT STATIONARY
DROMAEOSAURIDS	JULY 22 ND	FAST, HIGHLY INTELLIGENT, CAN OPEN DOORS
PERSEIDS	AUGUST 12 TH	INSTEAD OF FALLING FROM SKY, METEORS ERUPT FROM GROUND
TAU PYRAMIDS	AUGUST 15 TH	VISIBLE EVEN WHEN EYES ARE CLOSED
DRACONIDS	OCTOBER 8 TH	VERY SLOW, BUT FOLLOW YOU IF YOU RUN
ORIONIDS	OCTOBER 21 ST	ENTIRE SHOWER HAPPENS AT ONCE
LEONIDS	NOVEMBER 17 TH	IN 1966, UNUSUALLY ACTIVE LEONID SHOWER KILLED GOD
GEMINIDS	DECEMBER 13 TH	CAN BE DEFLECTED WITH TENNIS RACKETS

Remember, meteors always hit the tallest object around.

Explanation

This comic spoofs the way that astronomical events are often reported in the mass media — events are often tagged with undeserved superlatives or described as being more dramatic than they actually are. In some cases, outright misinformation is spread. This phenomenon occurs in part by the result of over-eager scientists, but mostly because of journalists with no deeper knowledge on the subject they write about.

Meteor showers typically occur regularly each year. It always happens at the same days because the Earth is crossing the dust path of a particular comet. Sometimes meteor showers are in fact likely to be relatively spectacular when the peak of the shower occurs while your part of the world is in darkness and there is little moonlight. However, even in these cases it must be understood that there is nothing unusual about the meteor shower itself. The shower consists of small particles about one millimeter in diameter. Only their high speed lets them produce enough light to be visible from Earth's surface. The names of the showers refer to the constellation from which they appear to radiate.

Most of the meteor showers listed in the comic are real, but some are made up (and indicated as such below).

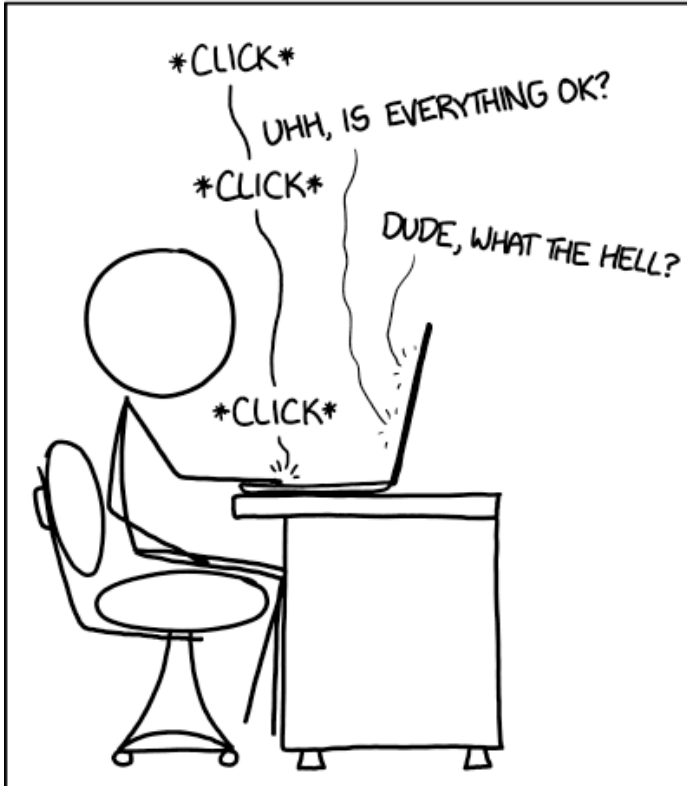
The title text refers to the folk wisdom that lightning strikes the tallest thing around, but this has never been applied to meteors, where it is basically the size (area) that

determines the likelihood of an impact with a given object. Randall expressed frustration over how "maddeningly inexact" the lightning statement is, and elaborated on the problem mathematically, in the what if? Today's topic: Lightning.

#1250: Old Accounts

August 12, 2013

THE INTERNET IS FILLED WITH DERELICT ACCOUNTS
AGGREGATING NEWS ABOUT FRIENDS LONG FORGOTTEN.



WHEN YOU FIND YOURSELF DRIFTING AWAY FROM A
COMMUNITY, REMEMBER TO CLEAN UP AFTER YOURSELF
BY SLOWLY UNFRIENDING EVERYONE, ONE BY ONE,
IN THE REVERSE ORDER THAT YOU ADDED THEM.

If you close an account while it's still friends with people, it contributes to database linkage accumulation slowdown, which is a major looming problem for web infrastructure and definitely not a thing I just made up.

Explanation

Cueball is very dramatically following the described process of removing himself from a social network by first unfriending each contact in reverse order that he friended them. Such actions are not necessary on any well-designed website. Actively unfriending people individually could be perceived as rude, antisocial, or in need of help. On the other hand, if a user simply abandons his or her account without cleaning it up, then even years later, it will still be sitting there, gathering friends' statuses, opinions and comments.

The reverse order to unfriend people refers to practice of correct resource management in computer programming. Computer programs typically require access to many resources at a time, and some of those resources may only be available insofar as the program has access to other more basic resources.

For example, if you wanted to watch a movie from a rental service, you would first acquire a keep case with a disk inside of it, and then you would remove the DVD from the case in order to play it on a TV. Once you had watched the movie, you would put the DVD back inside the case. Then you would return the case to the store. The process for "releasing" these two resources (the DVD and the keep case) follows the reverse order of how they were obtained: the case was retrieved from the store before the disk was removed, but the disk must be put back before you return the case.

A computer program must release resources in a valid order, though it is often difficult for programmers to ensure this, due to the many paths of execution a program can follow. If resources are released in the wrong order, then a newer resource may reference an older resource that has already been destroyed, and when attempting to use the remaining resource, a variety of bad things could happen if the program attempted to access the already lost resource.

While resources do not always need to be released in exactly the reverse order of how they were obtained, doing so ensures that, as each resource is released, none of the resources that existed when it was acquired (and thus which it could be dependent upon) will have been released yet.

In the case of unfriending users on a social networking site, it is imagined that Cueball or any other user could have made newer friends through older friends, and as such, that the newer friend should not exist without the older friend and must therefore be released first.

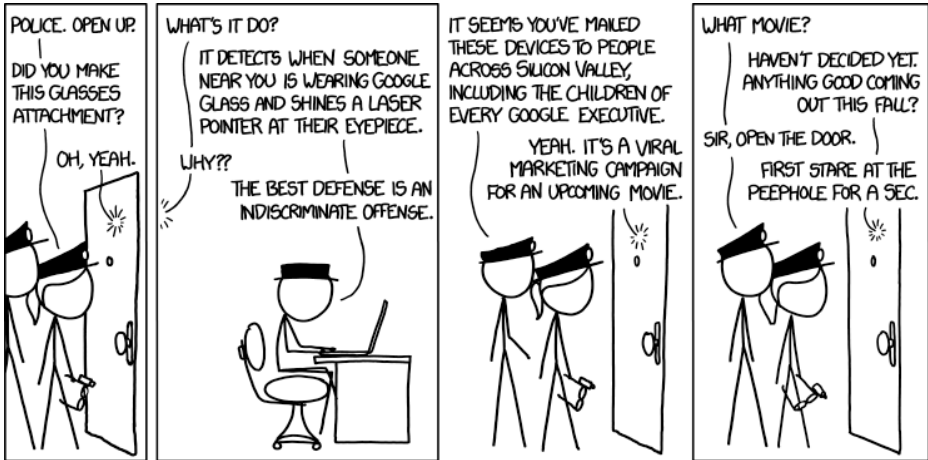
The title text appears to be referencing related issue affecting databases used on websites such as social networking sites. When an account is deactivated, the database entries for users that were friends with the account may maintain a link to it. This would result in the database storing useless data, so a well-designed database might try to mitigate this. A well-written program accessing the database would be able to recognize that this data should be ignored. Since no user

account would be directly dependent on the existence of another account, the accounts can safely be deleted without worrying about resource management as described earlier.

Ultimately, the inefficiency of a database containing useless data about deleted accounts is negligible, and in fact it may not even be worthwhile to take the time to update all the entries compared to how little time it would save when performing lookups. "Database linkage accumulation slowdown" really is a thing that Randall just made up. This may be a satire of popular fears of made-up technological problems, often held by those who are not technologically savvy.

#1251: Anti-Glass

August 14, 2013



'Why don't you just point it at their eye directly?' 'What is this, 2007?'

Explanation

Black Hat makes an attachment for eyeglasses which shines a laser light at people using Google Glass. The quote "The best defense is an indiscriminate offense" plays off the adage "The best defense is a good offense". Black Hat's goal seems to be to interfere with the Google Glass user potentially recording the person with the laser, and possibly blinding Google Glass users, undermining the project. By mailing one to the children of every Google executive, who are likely to be Google Glass users, he's clearly aiming to disrupt the entire Google Glass project. "Silicon Valley" is a term for the southern San Francisco Bay Area where many technologically up-to-date people live who are more than likely to work in the computer industry and use Google Glass.

The "viral marketing campaign" excuse seems to play off how battery-powered LED placards were mistaken for terrorism in the 2007 Boston bomb scare. He pretends that his terrorism is actually a viral marketing campaign, but seems to have not thought this excuse through. He then tries to get them to look into a laser light.

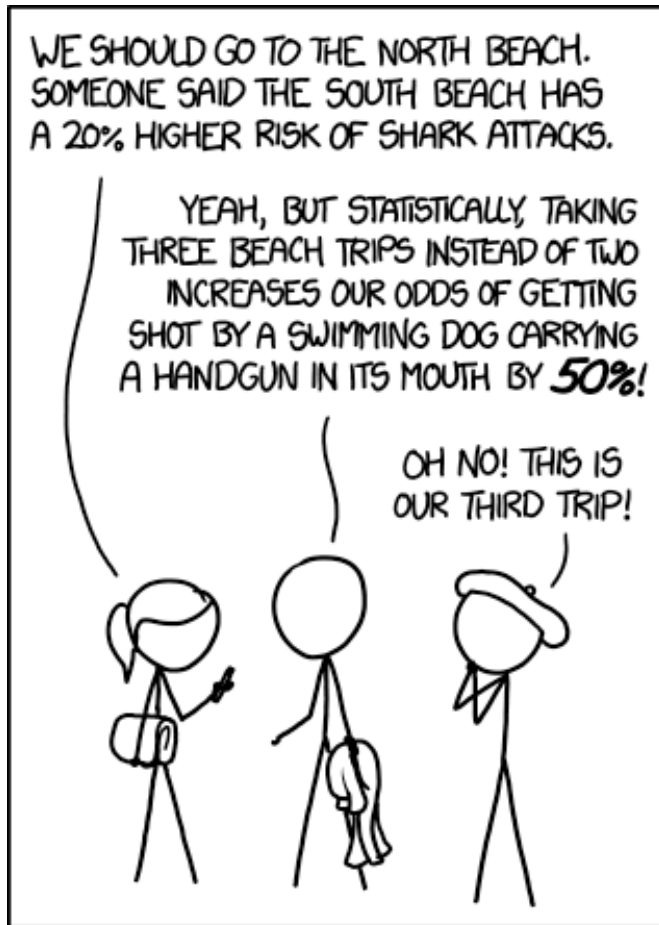
The title text shows the irony between Black Hat's needlessly complicated technical solution, and his apparent hate of Google Glass, a relatively new technology. In addition, he remarks that he wouldn't do something as old-fashioned as shining a laser in peoples' eyes, as this does not live up to his technical expertise.

However, he could shine a laser through the peephole, which would have the same effect on the police officers.

It seems generally that Randall is no fan of Google Glass, which was also shown later in 1304: Glass Trolling. It was the second time they are mentioned in xkcd after 1215: Insight, but this was the first direct mocking of people wearing these glasses. Google Glass has become a recurring theme in xkcd.

#1252: Increased Risk

August 16, 2013



REMINDER: A 50% INCREASE
IN A TINY RISK IS *STILL TINY*.

You may point out that strictly speaking, you can use that statement to prove that all risks are tiny--to which I reply **HOLY SHIT WATCH OUT FOR THAT DOG!**

Explanation

The panel satirizes the common misunderstanding of the concept of percentage. Quoting a percentage change without mentioning the base probability that this ratio acts on is meaningless (outside of arithmetic for arithmetic's sake). Most everyday communication, however, succumbs to such incompleteness. In the aftermath of this ambiguity, people tend to conflate relative and absolute changes.

If the probability of a shark attack at the North beach is 5 per million, then the probability of shark attack at the South beach is still not more than 6 per million. The difference between these values is not enough to normally justify choosing one beach over the other, even though a "20% greater" chance sounds significant when stated out of this larger context.

Cueball parodies the concern by noting that by going to a beach three times instead of two, their chances of attack by dogs with handguns in their mouths (a ludicrous and unrealistic scenario as dogs cannot buy guns[citation needed] and are not likely to pick one up off the ground) increases by 50%. If the chance of the dog attack is one per billion on each visit to the beach, then the chance of attack increases over multiple visits; regardless it's still one in a billion for any specific visit. This does not change the overall improbability of there ever being a dog swimming with a gun in its mouth.

Beret Guy misunderstands Cueball's probability, exhibiting the gambler's fallacy by believing that since they haven't been attacked in their first two trips, the chance of attack by dogs with handguns is higher on this outing.

This is a common misunderstanding of statistics. While the overall probability of an attack in three trips would be higher than in a single trip, it doesn't change the fact that in each individual trip, the probability is still the same; whether or not they managed to avoid being attacked in their first two trips, the results of these trips do not factor into the probability equation of the third trip.

This also can be illustrated by coin flips: if one flips a "fair" coin ten times in a row, no matter what the result of each previous flip is (even if it were nine heads in a row), the odds of getting heads on the tenth coin flip theoretically remains 50%. In other words, past experience does not impact subsequent flips. In practice, if the odds on each flip were 50%, then the odds of nine heads in a row would be 0.2%, so after it might be worth considering the possibility that the coin has been bent or weighted to alter the odds, or even a counterfeit with "heads" on both sides.

The caption clarifies Cueball's point, but without sarcasm.

Then again, the title text objects to this point (that a tiny risk increased by 50% is still tiny). If this 50% increment is

done repeatedly, the risk can get arbitrarily high, while the statement says that it is still tiny. This can be compared to the Sorites paradox (the "paradox of the heap"), which involves a "heap" of sand from which grains of sand are removed individually. If one assumes that, after removing a single grain, a heap of sand is still considered a heap of sand, and that there are a limited number of grains of sand in the heap, then one is forced to accept the conclusion that it can still be considered a heap of sand even if there is only a single grain of sand (or even none at all).

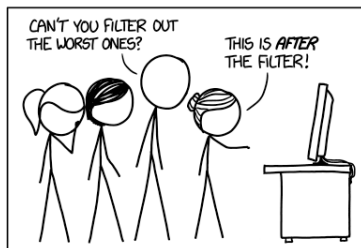
Being shot by a swimming dog with a handgun in its mouth is also specifically referenced in what if? 146, Stop Jupiter.

#1253: Exoplanet Names

August 19, 2013

AUGUST 2013:
THE INTERNATIONAL ASTRONOMICAL UNION
DECIDES TO START NAMING EXOPLANETS,
AND — FOR THE FIRST TIME EVER — ASKS FOR
SUGGESTIONS FROM THE GENERAL PUBLIC.

THEY IMMEDIATELY REGRET THIS DECISION.



STAR	PLANET	SUGGESTED NAME		
GUEISE 667C	b	SPACE PLANET	UPSILON ANDROMIDEA	c STAMPPY
	c	PILF		d MOONCHILD
	d	A STAR		e HAM SPHERE
	e	e'); DROP TABLE PLANETS; --	HD 20794	b COSMIC SANDS
	f	BLOGOSPHERE		c LEGOLAND
	g	BLOGODROME	HD 85512	d PLANET WITH ARMS
	h	EARTH		b LAX MORALITY
				c GOOD PLANET
TAU CETI	b	SID MEIER'S TAU CETI B	HD 40307	d SLICKLE
	c	GIANT DOG PLANET		e SPARE PARTS
	d	TINY DOG PLANET		f NEW JERSEY VI
	e	PHIL PLAINET		g HOW DO I JOIN THE IAU
	f	UNICODE SNOWMAN		b NEIL TRYSON'S MUSTACHE
GUEISE 832	a	ASSHOLE JUPITER	GUEISE 163	c HELP@GMAIL.COM
GUEISE 581	b	WAIIST-DEEP CATS		d HAIR-COVERED PLANET
	c	PLANET #14	PI MENGSAE	b MOON HOLDER
	d	BALLDERAAN	HD 189733	b PERMADEATH
	e	ETERNIA PRIME	KEPLER-22	b BLUE IVY
	f	TAUPE MARS	KEPLER-3284	b BLAINSLY
	g	JELLY-FILLED PLANET	KEPLER-3295	b UNICORN THRESHER
EPSILON ERIDANI	b	SKYDOT	KEPLER-2418	b SPHERICAL DISCWORLD
	c	LASER NOISES	KEPLER-1686	b EMERGENCY BACKUP EARTH
GUEISE 176	b	PANDORA	KEPLER-3010	b FEEEOOOOOOOOOP
	c	PANTERA	KEPLER-4742	b LIZ
KEPLER-61	b	GOLDENPALACE.COM		

If you have any ideas, I hear you can send them to iaupublic@iap.fr.

Explanation

On the 14th August 2013, the International Astronomical Union (IAU) issued a document about public naming of astronomical objects. It stated, "IAU fully supports the involvement of the general public, whether directly or through an independent organized vote, in the naming of planetary satellites, newly discovered planets, and their host stars."

The text above the image states the fact above and then notes that the IAU immediately regret this decision. As we can see from Cueball's question, from Ponytail's facepalm, and the fact that even Megan is speechless, the suggestions are appalling. It becomes even worse when Hairbun tells them that an automatic filter has already been applied to the results, one designed to remove inappropriate entries that don't meet certain criteria. This implies that the list would have been even worse if presented in its unfiltered form (as seen below in the table).

The naming document also contained, amongst other things, guidelines that suggested names should meet. These include stipulations such as "16 characters or less", "preferably one word", being "pronounceable (in as many languages as possible)", "not too similar to an existing name of an astronomical object", avoiding commercial names, and being "respectful of intellectual property". If we go down the list, we can see that many of Randall's suggestions do indeed violate the guidelines. Which is

part of the joke as it reflects the tendency of internet submissions to ignore such softly suggested guidelines.

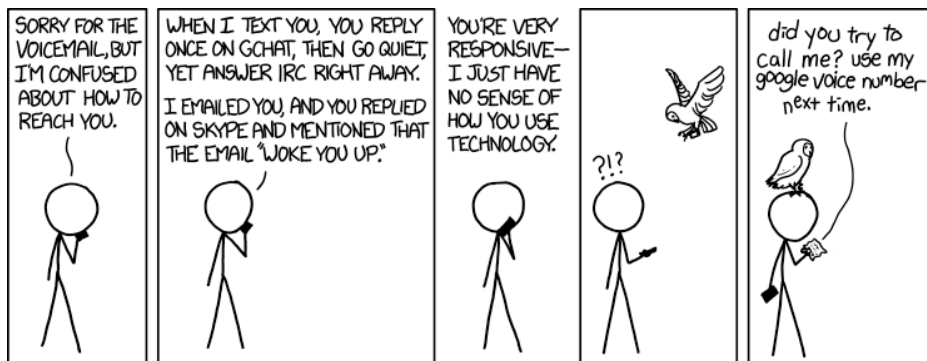
The randomness and inappropriateness of the suggested names reflects the commonly expected response from anonymous submitters on the internet. Many forums and contests that call for online response and do not apply strict control over the responses receive similar collections of random, inappropriate and obscure submissions that are often only tangentially related to the original subject. For example, Greenpeace held a naming contest for one of the whales recently tagged in their research and preservation campaign and even after selecting the finalists the online voting resulted in naming the whale "Mr. Splashypants". PepsiCo had even less restrictive controls in their marketing campaign that asked the internet to name a new flavor of Mountain Dew. They had to shut down the contest in order to avoid naming the new beverage "Hitler did nothing wrong" which was the current leader at the time and only marginally the most inappropriate of the top ten voted suggestions. Even more recently is the case of Boaty McBoatface, in which the internet decided to dub a British research vessel "Boaty McBoatface". The boat was given the name RRS Sir David Attenborough in the end, with its Autonomous Underwater Vehicle being called "Boaty McBoatface."

The document also states that naming suggestions may be sent to the email that Randall included in the title text.

This comic was updated in 1555: Exoplanet Names 2.

#1254: Preferred Chat System

August 21, 2013



If you call my regular number, it just goes to my pager.

Explanation

As more options become available for communication, it becomes more difficult to determine the social etiquette of communicating with others. It is customary (or at least rarely incorrect) to return a communication from someone using the same medium as the initial contact. For example, a voicemail is generally returned with a phone call (perhaps resulting in another voicemail), and an email with an email, etc. However, sometimes people respond through a different channel, such as texting a response to a voicemail or emailing a reply to a text. This can create confusion that Randall is pointing out, because the recipient may be unsure whether to go back to their original communication method, or if the response was a signal that the recipient prefers the new method. Similarly, it becomes important for people to know what type of communication is preferred by a recipient, or most likely to reach the recipient quickly and generate the most useful response.

Randall portrays the difficulty Cueball is facing when communicating with a seemingly irrational recipient. Today's multitude of social networks and communication systems amplifies the problem. After several misses, Cueball is leaving a voicemail for his intended recipient to clarify the best way to reach them. He initially tried texting the recipient, to which they made one reply on the instant-messaging service Google Talk (commonly called GChat). This is unusual because instant messaging services are usually used to engage in

longer conversations than one message. Cueball further is confused because the recipient, although silent on Google Talk, continues responding on IRC. Cueball then attempted to communicate by email, but the response came on Skype, another instant messaging service that features voice and video chat along with text. The recipient mentions that the email "woke [them] up", implying that they have e-mail configured to make an audible alert, possibly by being forwarded to a cell phone.

Cueball clarifies that he appreciates that the recipient is very quick to respond, but his confusion stems from his inability to determine the proper medium to use. As he finishes his voicemail, an owl (appears to be a Barn Owl from its face) flies towards him carrying a written message. This appears to be a reference to owl post, which is a form of communication in the Harry Potter lore which itself is presumably based on the real-world usage of carrier pigeons. The owl post message indicates that the voicemail was received, and suggests using Google Voice next time, which is yet another form of voice and text communication, one that bypasses the standard telecom companies and gives the user a range of controls such as which device is called depending on who is calling or what time of day it is, or to simply ignore the call altogether.

Randall seems to have an interest in bird-related communications; RFC 1149 - IP over Avian Carriers has been mentioned in previous comics.

The title text mentions a pager, a low-tech, low-cost wireless telecommunications device that beeps or vibrates when it receives a message. Simpler pagers can display numbers, usually the caller's phone number plus a couple of additional digits, while more sophisticated ones can receive text messages. The usual intent of a pager is for the recipient to call the number back or, today, to tell you that your table is ready. Pager use peaked in the 1980s and 1990s, but declined thereafter as cellular phones became ubiquitous. There can be absolutely no need for this hyper-connected individual to use a pager, and having your own cellphone forward messages to your pager makes almost no sense. The question in the beginning of the owl-message further suggests that the receiver did not actually receive the voicemail, but just had Cueball's phone number displayed on his pager.

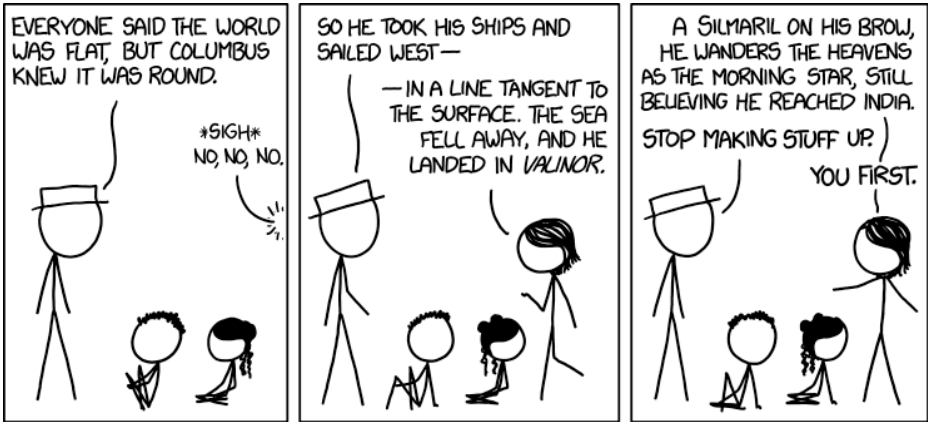
A possible suggestion is that they are intentionally using such an abundance of communications options to, perversely, make it harder to have a conversation with them. So far, it seems to be working. If this is true, the person Cueball is trying to contact may very well be Black Hat.

Another suggestion is that Cueball is attempting to contact Beret Guy, as Beret Guy is known for doing odd things such as this.

This comic is closely related to a later comic, 1789: Phone Numbers.

#1255: Columbus

August 23, 2013



And thus was smallpox introduced into the previously Undying Lands.

Explanation

The comic starts with White Hat telling the two children shown on the first panel that Christopher Columbus knew the world was round, but that others believed it to be flat. However, this is a false narrative known as the Myth of the Flat Earth. Educated people in Columbus's time knew the world was round, and knew the approximate radius of the Earth. Columbus claimed that the distance to sail west from Canary Islands to Japan to be about 3,700 km, drastically lower than others believed, but he was wrong about this. If another continent and the "West Indies" had not been fortuitously in the right place, Columbus and his crew probably would have died at sea.

As White Hat begins his explanation, Megan objects, though not explaining why. White Hat continues, so Megan interrupts, saying that Columbus went in a straight line as the world curved away, ending up in Valinor and the Undying Lands. Megan's story is an allusion to *The Silmarillion*, by J. R. R. Tolkien, set in the same world as *The Lord of the Rings* and *The Hobbit*. The claim that Columbus sailed on a tangent to the surface alludes to how the elves' ships leave the curved sea surface and sail in a straight line to reach Valinor on the same route that they sailed when the world was still flat. The mentions of a silmaril and the morning star are a reference to Eärendil the Mariner, the only mortal sailor to reach the Undying Lands, with one of the Silmarils (though Eärendil's journey occurred at

the end of the First Age and the world was only changed into a sphere near the end of the Second Age). Megan humorously conflates these myths, suggesting that they are all equally false. Columbus in fact wasn't the first to claim the world was round; the ancient Greeks had discovered it long before. It was, however, disputed by some Christian scholars in late antiquity due to disagreements over its congruence with biblical canon. In Megan's telling, Columbus ends up as the morning star, which is actually the planet Venus (the same fate as Eärendil's in Tolkien's mythology).

The joke is that when White Hat tells her to stop making up the story, Megan pointedly replies "You first", indicating that she originally complained about White Hat's retelling of the Columbus story because his account didn't really happen, and so he was also "making things up". Megan's fantasy tale was then delivered to make a point.

The title text refers to the transfer of smallpox to the Americas by Europeans, which caused the deaths of untold millions of Native Americans. The introduction of smallpox to the Undying Lands would indeed make their name ironic. However, the Undying Lands are named after immortal Valar, Maiar, and Elves living there, not because they confer immortality. A more proper name would be the Lands of the Undying, and Valar, Maiar, and Elves are not susceptible to diseases in Tolkien's mythos in any case.

Similar discussions between White Hat and Megan can

be found in 1605: DNA and 1731: Wrong, in the latter Megan even finishes with a similar *sigh* as she started with here.

August 26, 2013

[illegible]

330

Explanation

Google, a rather popular internet search engine,[citation needed] has a feature known as autocomplete that guesses at search queries before they are fully typed out. These guesses are generally made based on popular searches by other people. From time to time, a particularly strange or hilarious one may be found, as is evidenced in this comic.

The largest pictured questions are: "Why are there slaves in the bible" and "Why are there ants in my laptop".

All of the questions in the comic are "why" questions, so many of them are predicated on false assumptions, such as "Why are there pyramids on the moon". Originally, all these questions and many more (33,171 in total) could be found at <http://xkcd.com/why.txt> (archived version).

There are many reasons Randall may have chosen to highlight so many disparate questions without answers. Some questions have simple answers, some are difficult, some have many different potential answers, but all of them show humans seeking knowledge. There are no stupid questions.

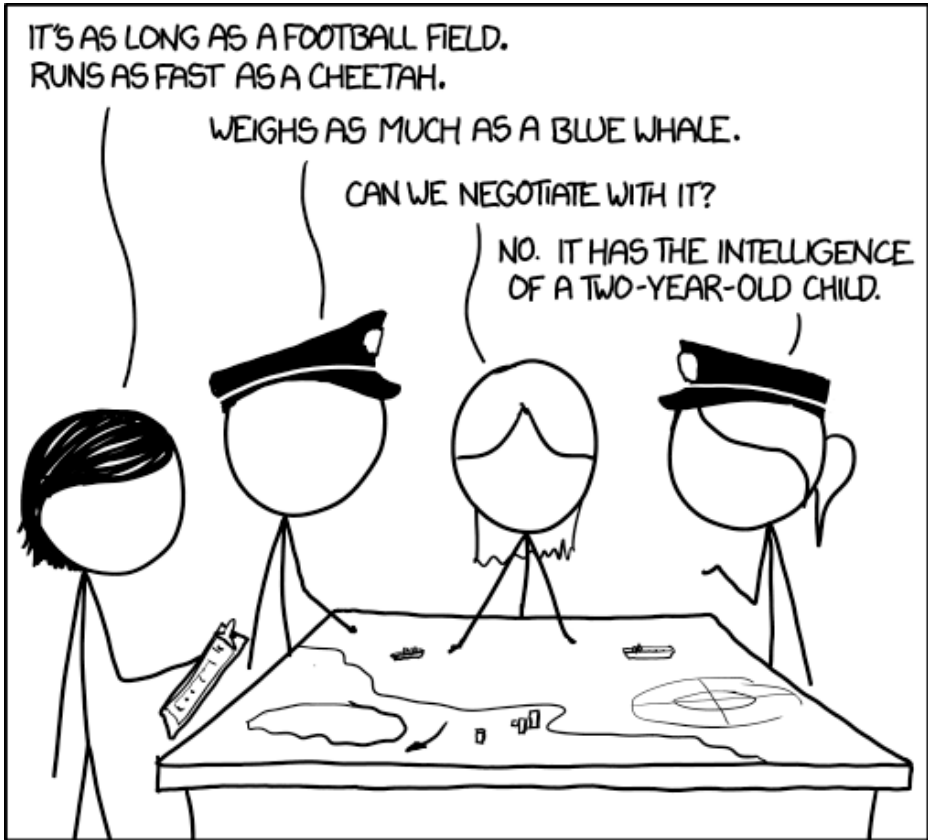
Title text[edit]

The title text is a reference to the Peter Jackson films of The Lord of the Rings trilogy, where Arwen becomes sickly for unspecified reasons as the plot advances, apparently giving Aragorn a more personal reason to fight. The only explanation given is by Elrond,

who says "As Sauron's power grows, her [Arwen's] strength wanes." This subplot is entirely absent from the original novels.

#1257: Monster

August 28, 2013



BY THE TIME THE FREQUENTLY-MADE COMPARISONS MONSTER WAS FINALLY DEFEATED, IT HAD EATEN ENOUGH PEOPLE TO FILL A STADIUM AND DEVASTATED AN AREA THE SIZE OF RHODE ISLAND.

It was finally destroyed with a nuclear weapon carrying the destructive energy of the Hiroshima bomb.

Explanation

In this comic, officials and police are evidently trying to describe the extraordinary qualities of a huge monster by comparing it with everyday objects instead of numbers, which seems to be a recurring theme on xkcd (see 526: Converting to Metric, 1047: Approximations) and also in the Blag article Dictionary of Numbers where Randall says that he doesn't "like large numbers without context."

This comic pokes fun at how common it is in the media to compare things of extraordinary qualities to a certain narrow set of well-known objects. The comic features people discussing a fictional monster which - apparently - can be only described by these overused comparisons. The three used by Megan, Cueball and Ponytail are:

- The monster is as long as a football field. This is most likely an American football field (given the author is American). So the monster is about 120 yards/110 m long.

Here is an example from Wikipedia where a building is compared to the length of a football field.

- The monster runs as fast as a cheetah, at least 60 mph or 96 kmh.

The cheetah is famous for being the fastest land animal at full sprint. Like the monster, the cheetah is prone to comparisons: to cars, since 60 mph is a common highway speed limit. Unlike a cheetah, however, the monster's

speed is almost certainly thanks to its large stride.

- The monster is as heavy as a blue whale (about 180 tonnes).

Here is an example where the weight of a blue whale is used in two different comparison (something heavier and something lighter).

- Finally it is stated that it has the intelligence of a two-year-old child. Comparing someone's intelligence to a child of a given age is very common.

Here is an example where a dog is compared to a two year old kid.

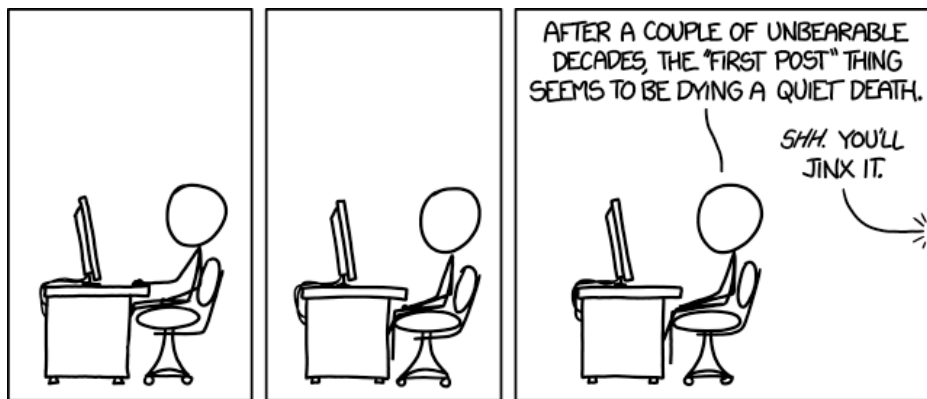
There is even an xkcd comic that is referring to this age IQ: 1364: Like I'm Five.

The caption below the panel names the monster the Frequently-Made Comparisons Monster, joking that the monster was created by comparing it to things, and continues the joke by comparing the number of killed people to those that could fill a (sports) stadium (of the order tens of thousands), and the area of devastation to the smallest state in the US Rhode Island It is also possible that the monster actually attacked a stadium full of people, and only devastated Rhode Island, similar to the title text.(1,214 sq mi/3,140 km²) (a state Randall also used for comparison in the What if? Everybody Jump. In another What if? he uses a football stadium filled with ants as a comparison: Lethal Neutrinos.)

The title text takes the joke one step further by comparing the nuclear bomb used to destroy the monster to the bomb dropped on Hiroshima at the end of the Second World War, i.e. they dropped a relatively small nuclear bomb on it (nuclear weapons have advanced significantly since WWII). Here is an example from Wikipedia of such a comparison with the strength of a meteor strike.

#1258: First

August 30, 2013



Fortunately, exactly zero other annoying internet behaviors have developed during this time.

Explanation

Firstposting, or thread sniping, is the habit of posting short messages to obnoxiously point out that you have found and seen the content first. This practice was far more common in the years leading up to this comic, when high-traffic and poorly-moderated social media sites tended to display comments in increasing chronological order by default; as such, the oldest comments would be most prominently displayed at the top, while the newest comments would be buried at the bottom.

In the first two panels, Cueball stares at his screen, implying that a long time passes before he finally points this out. He has probably submitted a post and is awaiting for comments that are not coming. Cueball might actually have mixed feelings about the practice slowly dying out. However, someone offscreen is worried he will jinx it, encouraging more people to do so.

In reality, Cueball's observation has held true, due to changes in best practices for web design. Social media sites in particular often sort comments by user rating; as such, the most appreciated comments are given the most prominence, and trollish comments like the cliché "F1rst p0st!!" are buried. Meanwhile, low-traffic forums with smaller communities still display comments from oldest to newest; in these environments, firstposters are reported and dealt with by human moderators in a timely fashion. In short, the internet as a whole does not reward

or reinforce firstposting the way it once did pre-2013. However, the small children who think that posting "FIRST!!!" makes them somehow relevant or funny still remain. Only growing up and realising how unnecessary and obnoxious posting "first" is will stop them.

See also 269: TCMP and 1019: First Post.

The title text sarcastically states that no new annoying internet behaviors have emerged since the "first post" trend began which would continue to annoy users: a fact which is clearly wrong to anyone who spends a length of time on the internet. See for instance 493: Actuarial.

#1259: Bee Orchid

September 02, 2013



In sixty million years aliens will know humans only by a fuzzy clip of a woman in an Axe commercial.

Explanation

Megan is explaining the evolutionary phenomenon of mimicry of female insects which fools male insects into trying to mate with the flower (pseudocopulation). This causes the pollen of the flower to stick to the male bee, who may make the same mistake with another flower, allowing for pollination.

This particular orchid mimicked the solitary bee *Eucera*, which now only pollinates it in the Mediterranean (the bee isn't really extinct, yet). This may eventually lead to the extinction of the orchid due to lack of reproduction. In most areas where it grows, the orchid is using a method of self-pollination, which can be detrimental to the genetic vitality of the species as it is a form of in-breeding.

Photographs of *Ophrys apifera*:

Female *Eucera* (*Synhaelonia*) guarding nests (left) and male *Eucera* (right):

In a similar way, some plants depend on animal species now extinct, but as the dependency was not about pollination but about spreading seeds across the land, those plant species can still last millions of years after the animal species extinction. For instance, it's the case of the avocado.

The comic plays on the subject of levels of indirectness of memory or knowledge representation. The female bee is

extinct, remembered only by the male bee's perception of her; the male bee is also extinct, but its memory of the female is preserved in the orchid's shape; the orchid, due to self-pollination, is nearing extinction, but the memory of the female bee is now preserved by Beret Guy's memory of the orchid, remembering the male bee's memory of her.

The title text culminates this theme by invoking the idea that some day human beings will, likewise, be extinct, and aliens will be able to learn about us through the distorted and faded representations of ourselves that we leave behind - Axe commercials, which, like the orchid, present an idealized form to deceptively attract mates. We are left to speculate whether these aliens will be able to construct, somehow, through three levels of indirectness (the human representation, the orchid's representation and the male bee's perception) any memory of the female *Eucera*, and, if so, how distorted a view of the bee it will be.

#1260: LD50

September 04, 2013



THE LD₅₀ OF TOXICITY DATA IS
2 KILOGRAMS PER KILOGRAM.

The dose is much lower when administered orally. We're still trying to get the paper into the needles for subcutaneous injection.

Explanation

LD50 is a term used in toxicology that identifies the median lethal dose of a toxin, or how much is required to kill 50% of a given population. LD50s are usually measured in g/kg, as the amount of toxin to kill something is usually linearly related to its mass. The lower the LD50, the more lethal the toxin. An LD50 can be determined for almost any substance: for example, the LD50 for sugar (in rats) is 29.7 g/kg. However, Botulinum toxin (commercially known as Botox in the beauty industry), the most acutely toxic substance known, has a LD50 of roughly 1 ng/kg, or 0.000000001 g/kg, a vanishingly small amount.

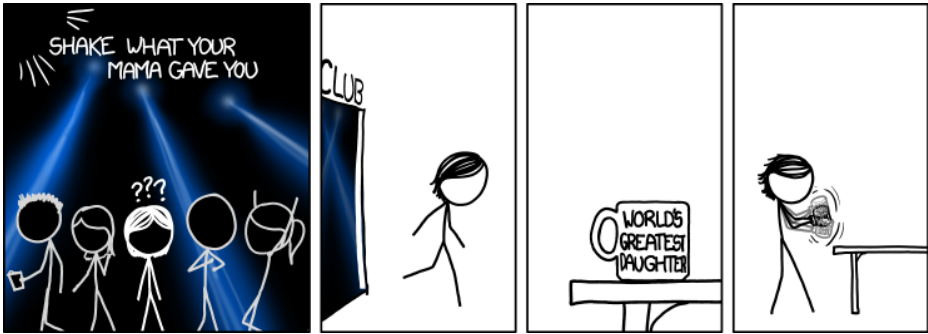
The comic is making the joke that the LD50 of papers on toxicology is 2 kg/kg, so it takes 2 kilograms of papers on toxicology to kill a person for each kilogram they weigh. The worldwide average weight of an adult is 62 kg (137 lb), so the lethal dose would be 124 kg (273 lb) of toxicology papers. Death is apparently caused by compression or smothering, rather than any form of toxicity.

The title text says it will take less paper to kill a person if the paper is shoved down their throat instead of dropped on them, either by suffocation or bursting the subject's stomach. A third method of delivering a toxin is by subcutaneous injections which are highly effective in administering vaccines and medications, but that number is omitted since they couldn't figure out how to

do it. The amount of paper required to trigger a fatal blood vessel blockage would probably be fairly small if they could.

#1261: Shake That

September 06, 2013



How do I work it? IT'S ALREADY WORKING!

Explanation

Visiting a club, Megan is exhorted by a phrase used in several songs, to "shake what your mama gave you", a crude euphemism typically used to encourage shaking one's body parts, referring to any of the sexually appealing anatomical parts of the dancer. Taking this exhortation extremely literally, Megan proceeds to locate a mug presumably given to her by her "mama" labeled "World's greatest daughter" and shakes it.

The phrase "shake what your mama gave ya" was in use as early as 1992, when it was the title of a song by Poison Clan, a southern hip-hop group that was influential from 1990–1995. Another version by Stik-E & Da Hoodz was released in 1995 by Phat Wax records. The line gained a wider audience when it was sampled by Fatboy Slim in the similarly titled "Ya Mama" on his 2000 album *Halfway Between the Gutter and the Stars*. More recently the line was featured in the Lil Jon single "Stick That Thang Out". In fitting with the general thematic composition of such a song, a large part of which revolves around either goading a woman to, or describing one who is dancing seductively in a nightclub - this line asks a girl to dance, thereby swaying her hips & buttocks, or breasts, the most common male 'fetishes' — making them more conspicuous in the usually dim ambiance because of the phase lag with the rest of the body, which may be attributed to non-rigidity of the elastic structures — for purposes of her male audience's gratification (whether it be solicited or voyeuristic).

The title text refers to another lyrical cliché, "work it", which typically refers to "working" one's body; again, generally seductively. The action may be considered work either from the point of mechanical work, or as a reference to a professional dancer. This naturally leads Megan to further confusion (as indicated by the title text) when taken literally, as she responds "it's already working!" It is not entirely clear if she is again referring to the mug, or simply another generic object not displayed in the comic.

1291: Shoot for the Moon may be a continuation of this, due to Megan misunderstanding common saying or references.

#1262: Unquote

September 09, 2013



I WONDER ON WHAT DATE *STAR WARS*
WILL BE QUOTED FOR THE LAST TIME.

I guess it's a saying from the Old Country.

Explanation

In this comic, Randall poses the future possibility that at some time in the future, even a popular film as Star Wars will become forgotten by society.

"May the Force be with you" is one of the many famous phrases from the Star Wars movies. Star Wars has become popular enough to remain part of today's popular culture almost forty years since its initial release, and the source and meaning of the quote is commonly recognized. This comic suggests that eventually even the enormously popular Star Wars will fade into obscurity — by which time, ironically, Star Wars-like hovercraft will have been invented.

It is not uncommon for once-popular sayings to lose popularity and come into disuse; particularly when the sayings are sourced from a pop-culture reference such as a book or film. In fact, there are entire books dedicated to such topics. Each generation generally develops its own pop culture-references which frequently become unrecognizable to the next generation. Only a handful of pop-culture quotes tend to survive for decades. For example, the phrase "Sit on it", coined by the creators of "Happy Days" as a TV-friendly but derogatory-sounding comeback for the character Fonzie. The phrase was very popular during the show's 1970s-80s heyday, but today is far less recognizable to those born after that era, and is not commonly referenced today.

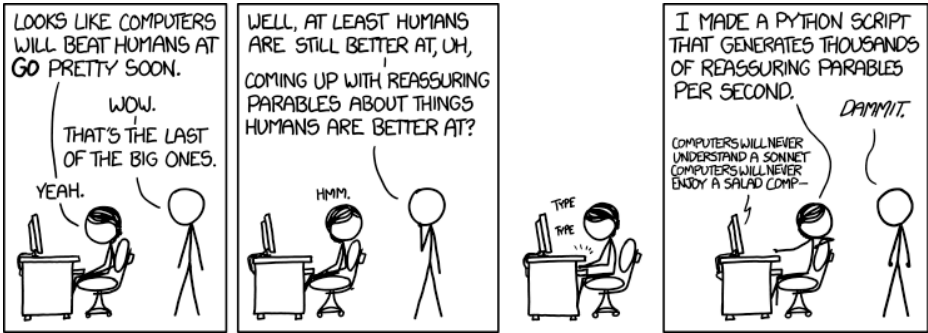
The title text suggests that the characters will write off the phrase as a saying from the "Old Country" (the foreign country or place where one's ancestors emigrated from). This is a play on the fact that ubiquitous film and TV quotes have not been around long enough for society to generally forget their origins, and the most common source for unfamiliar sayings in today's world are sayings from other countries where one's ancestors originated. The use of the expression in this comic implies that the speaker has no idea about the origins of the phrase. To him it might be a translation of a foreign expression, or from a long left-behind homeland.

A similar topic was addressed in 493: Actuarial, with Black Hat predicting when the last of the original Star Wars cast would die, and in 1093: Forget, predicting when the release of The Return of the Jedi would be forgotten. Also, 794: Inside Joke is about how much pop culture of centuries past has been forgotten.

The sentiment in this comic is similar to a quote from psychiatrist and author Irvin D Yalom:

#1263: Reassuring

September 11, 2013



'At least humans are better at quietly amusing ourselves, oblivious to our pending obsolescence' thought the human, as a nearby Dell Inspiron contentedly displayed the same bouncing geometric shape screensaver it had been running for years.

Explanation

Go is an abstract strategy board game considered computationally difficult, compared to chess. Because of the size and number of possible combinations, computers don't have an easy way to exhaustively search for the best move. Still, they are getting better and better playing it. Megan suggests that computers may soon reach the level of being able to beat the best human players, an artificial intelligence milestone that has already been accomplished with other games. At the time of this comic, Go was one of the last games where a computer can still be beaten by top humans (see 1002: Game AIs). However, in May 2017, Google's AI AlphaGo defeated the world's top human Go player. This was referenced three months later in 1875: Computers vs Humans.

As a common human response, Cueball attempts to offer the consolation or defensive statement that humans remain better than computers at something else (see also 894: Progeny). In this case, the first thing he thinks of is that humans are better at making such consoling statements. However, Megan disproves Cueball's statement by creating a script in the Python programming language to create an abundant supply of such statements. An irony here is that each of the statements the computer generates defends humans, not computers.

Another such statement is made in the title text, that

humans are better at quietly amusing themselves, oblivious to our "pending obsolescence" - which may refer alternatively to our inevitable deaths, or to the comic's own topic of our being replaced and surpassed by computers. The title text then again suggests, however, that the human statement is not true, referring to an Inspiron model of Dell computer which "quietly amuses itself" by showing a geometric screensaver as it presumably one day will be obsolete and replaced by a newer computer.

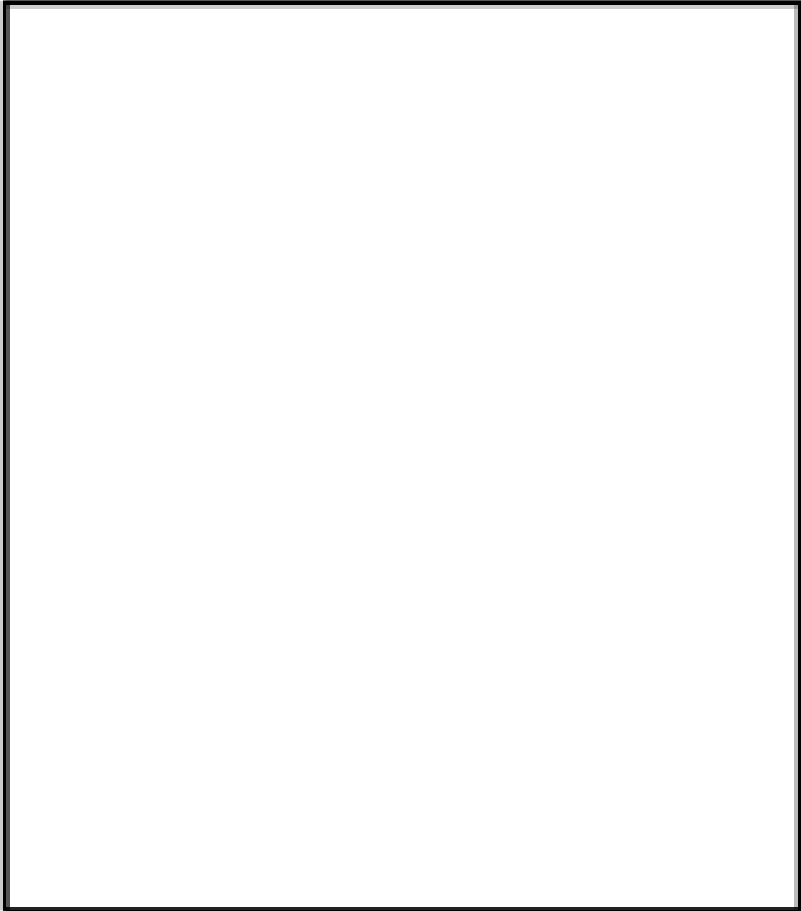
The original purpose of screensaver programs was to prevent images or characters from being burned into the phosphor layer of the older CRT displays. In more modern displays, including newer CRTs (cca mid-90s or newer), this could be achieved by simply turning it off after some period of time but originally there was no way to turn the display off programmatically. Thus the screensaver itself is already obsolete.

In 2022, Gwern Branwen used GPT-3 to generate reassuring parables.

#1264: Slideshow

September 13, 2013

DEAR WEBSITE OPERATORS,



Points to anyone who hacks the Flickr devs' computers to make their text editors do this when you click on anything.

Explanation

It is very common for websites to feature a gallery of images – a website for a school, for example, might feature pictures of the students and teachers. Some websites display images in the form of a slideshow like this comic, with slow zoom and pan effects and fades between the images. This effect has been dubbed the Ken Burns effect after documentary filmmaker Ken Burns who popularized the effect. In many cases, the slideshow is a fixed element, and can't be controlled by the user. This prevents the user from navigating through the images at their own pace or viewing any one image for an extended period, and can be distracting. Randall expresses frustration at this.

The title text suggests points will be awarded to whoever can add that annoying effect to the text editors of the developers of Flickr, a photo-hosting website, so they can be subjected to the same thing to which they are subjecting Randall. This may be a response to recent changes to Flickr's website that includes such slideshows as one option; that said, Flickr has always allowed users to browse galleries in a normal grid layout and with user-controlled photo-by-photo full-window layout.

#1265: Juicer

September 16, 2013



"OH YEAH, JUICERS ARE GREAT!
I USE MINE ALL THE TIME."

But the rind is where all the vitamins are!

Explanation

Juicers are typically used to crush fruits and/or vegetables, thereby extracting the liquid juice and creating a tasty, refreshing and easy to consume drink. However, in this case, instead of actual fruits or vegetables, someone is making juice from Fruit Gushers, a chewy fruit-flavored candy, thereby extracting a nearly nutritionless artificial "juice" out of a candy casing which was formulated specifically for human consumption.

This may or may not be a parody of "Fruit Gushers" television commercials, in which Fruit Gushers are shown to squirt out nearly limitless amounts of "juice" that was released around the time of upload.

The title text asserts that the rind is where all the vitamins in the fruit reside. This is a common belief of actual fruits, although it is an untrue urban legend for many fruits; even fruits like apples do not contain most of the fiber in the skin itself, but rather directly below; although when you peel an apple you remove more than just the skin, losing also some high fiber content anyway. It is absolutely absurd as in this case, though, as the "rind" of a Fruit Gusher consists mainly of sugar. This text mocks the usual sentiment that the less desirable part of a food is the part that is "better" for you.

It is also a parody of the notion that buying a juicer, or other things like exercise equipment, will automatically make people healthier. Here it is shown that what you do

with the juicer is the relevant factor. It is a little hidden joke that there is way more red than blue, pointing out how Gushers always have more red than blue.

The comic can also be interpreted as parodying the idea of fruit juices being healthy. Though this is widely believed, studies from 2013 demonstrate otherwise.

#1266: Halting Problem

September 18, 2013

```
DEFINE DOESIT HALT (PROGRAM):  
{  
    RETURN TRUE;  
}
```

THE BIG PICTURE SOLUTION TO THE HALTING PROBLEM

I found a counterexample to the claim that all things must someday die, but I don't know how to show it to anyone.

Explanation

In 1936 Alan Turing proved that it's not possible for an algorithm to decide whether an arbitrary program will eventually halt, or run forever. This was later called the Halting problem by Martin Davis. The official definition of the problem is to write a program (actually, a Turing Machine) that accepts as parameters a program and its parameters. That program needs to decide, in finite time, whether that program will ever halt running these parameters.

The halting problem is a cornerstone problem in computer science. It is used mainly as a way to prove a given task is impossible, by showing that solving that task will allow one to solve the halting problem.

Randall, however, is providing a simpler solution. He implements his own code for the question "Does it halt?" which always returns "true", and directs us to think about the bigger picture.

From a physical perspective, according to our current understanding of physics, this is right. Given enough time, any program will halt. This is due to factors external to the actual program. Sooner or later, electricity will give out, or the memory containing the program will get corrupted by cosmic rays, or corrosion will eat away the silicon in the CPU, or the second law of thermodynamics will lead to the Heat death of the universe. Nothing lasts forever, and this includes a

running program.

From a mathematical point of view, this is not true: a Turing machine will never have a hardware failure because it's not a physical machine. It's a theoretical construct, and it's defined mathematically, independent of any physical hardware. Similarly, $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$ no matter what any physical hardware you are computing it on claims.

Another interpretation of Randall's code is that, assuming the language uses an eager evaluation strategy, the Program in the parentheses is actually being run whenever his function is called. In this case, the function would wait until the program finishes and exits before returning "True". Therefore, Randall's function is mathematically accurate. It does not solve the problem though, as it simply shifts the question to whether the function itself will ever halt. If his language uses lazy evaluation, the input program is completely ignored, and it reduces to the incorrect mathematical interpretation.

From a practical point of view, there are of course times that a programmer would want to return "false", since some programs can be mathematically shown to run forever.

The title text further relates to this issue by claiming to have found a case where something need not die, but Randall does not know how to actually show it to anyone, because just the fact everyone will die sooner than it doesn't prove it will not die. The wording of the

title text might also be a reference to Fermat's Last Theorem.

It should be noted that Randall's solution, barring its unsoundness, solves more than the halting problem in the form it is usually stated. The halting problem requires two parameters (a program and its parameters), while Randall's function only accepts one (the program). The question of whether a program halts for every input can be shown to be even harder to solve than the halting problem, meaning that even if a Turing machine had an additional instruction allowing it to check whether a program halts with given parameters, it still could not always confirm that a given program that halts for all parameters does so.

The code in this comic is written in pseudocode, to demonstrate the "algorithm" rather than an implementation in some existing programming language. The syntax resembles a mix of C and Python.

The proof that the halting problem is unsolvable is to write a new function that uses Randall's program:

If Randall's function says that `META_DOESITHALT` halts by returning "TRUE" - then that makes `META_DOESITHALT` loop forever. But if it decides that it must not halt by returning "FALSE" - then `META_DOESITHALT` halts.

This proves that `DOESITHALT` can't possibly work - no matter what it actually does.

This is the software equivalent of "Everything I say is a lie".

#1267: Mess

September 20, 2013



MY ROOM NEVER LOOKS AS NICE AS THE
ROOMS OTHER PEOPLE APOLOGIZE FOR.

'Sorry, I left out my glass of water from last night.' OH
GOD I APPARENTLY LIVE IN A GARBAGE PIT.

Explanation

There is a common psychological phenomenon which causes people to mentally magnify their own flaws, while failing to notice the flaws of others, so common it apparently doesn't have a specific scientific categorization. Many self-conscious people apologize for "the mess" in their home whenever they have guests over, no matter how clean it may actually be. If the house is neater than the guest's own home, the guest is likely to say to themself: "If they think this is messy, what would they think of my place?!"

This phenomenon is shown in the comic when Cueball's friend apologizes for the mess, despite the only thing appearing out of order is what seems to be a crumpled article of clothing on the floor. This "mess" only amplifies Cueball's fears about his own lifestyle, as he is surely wondering what his friend might think of his messy lifestyle based on their much higher standards.

In the title text, Cueball's anxiety is further amplified when the host left out a glass of water from the night before and apologizes for it. Cueball is nervous because when this seemingly small oversight, when applied to his friend's very high standards, might seem like a huge problem, and in his mind, making his home akin to something he thinks is no better than a garbage pit.

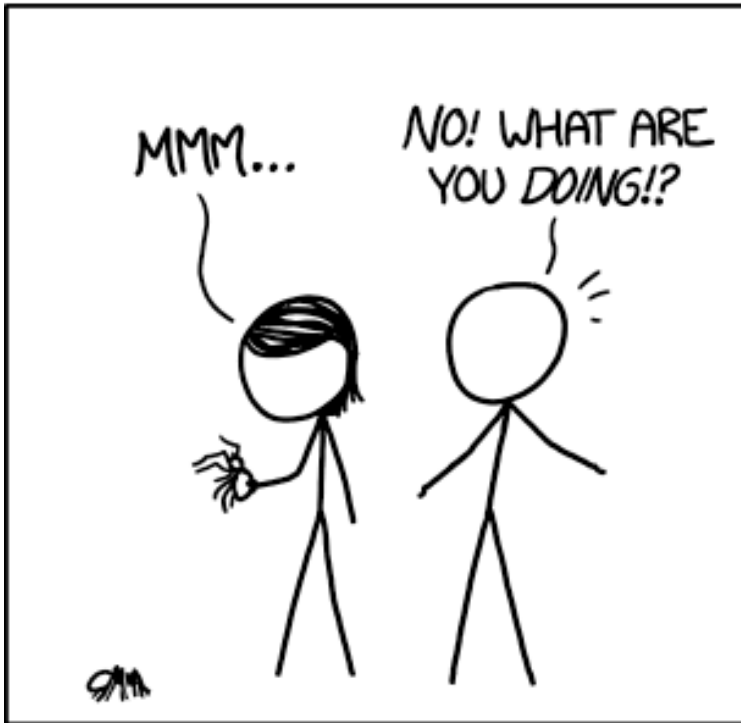
In 1565: Back Seat the exact opposite reaction to having to show other people a real messy place is used for the

joke.

#1268: Alternate Universe

September 23, 2013

IMAGINE YOU WERE TRANSPORTED TO AN
ALTERNATE UNIVERSE JUST LIKE YOUR OWN,
EXCEPT PEOPLE OCCASIONALLY ATE SPIDERS.
YOU CAN'T CONVINCE ANYONE THIS IS WEIRD.



THIS IS HOW I FEEL ABOUT LOBSTER.

As best as I can tell, I was transported here from Earth Prime sometime in the late 1990s. Your universe is identical in every way, except for the lobster thing and the thing where some of you occasionally change your

clocks for some reason.

Explanation

Randall is trying to make the point that eating lobsters is as weird as eating spiders. Crustaceans and arachnids are both arthropods, members of the same phylum, so his comparison isn't too far off. Then again, humans are in the same phylum (chordates) as sea squirts, so any perceived similarities are not exactly rooted in a close biological relationship. In addition, lobsters were once considered the "cockroaches of the sea", and a captain trying to feed his crew with lobster would often be seen as cruel; although there is some justification for that mindset as lobsters were served by being crushed into mush, shell and all, and boiled into a bland gruel. On the other hand, cooked tarantula spiders are considered a delicacy in Cambodia.

One common objection to eating spiders, crickets, roaches, and ants is that they are sometimes eaten whole, with guts, feces, and chitin devoured indiscriminately. However, many people eat only the actual muscles of the lobster, the same as one would any vertebrate.

In the title text, Randall suggests a fantastical reason for why he is so repulsed by eating lobster; he was actually born on a world almost completely identical to Earth, and was unknowingly relocated to our Earth when he was a teenager. The sentiment expressed here is that the act of eating lobster feels outright alien to him. This might be a reference to the Mandela Effect, which is a suggestion by various peoples - some jokingly, some

seriously - that groups of people occasionally get transported into alternate realities as an explanation for why so many people were certain that Nelson Mandela died in the 1980s despite him actually dying in 2013. (Contrary to popular belief, the Mandela Effect is not rationalising those false memories but rather why so many people have the same false memory.)

To feel that strongly about shellfish-based cuisine, he would have to have not been exposed to it until his adolescent years; this seems unlikely, as the real Randall Munroe was born about 60 miles inland from the United States' northern east coast, where said cuisine is particularly prevalent. In reality, he is probably merely grossed out by the idea of eating lobster, and is probably exaggerating his feelings for comic effect. The title text also references changing clocks to and from Daylight Saving Time (DST), a practice which Randall has previously shown disdain for, mocking its irrational premise in several comics. Again, he is likely comically exaggerating his feelings, unless he literally doesn't recall a time before his teenage years when his parents ever changed the clocks in accordance with DST.

The term "Earth Prime" is typically used in fictional multiverse settings, as a way to conveniently distinguish the Earth in which the narrative is rooted from any other Earths featured in the story.

The idea of a alternative universe where Brussels sprouts taste good was the subject in 2241: Brussels Sprouts Mandela Effect.

#1269: Privacy Opinions

September 25, 2013

OPINIONS ON INTERNET PRIVACY

THE PHILOSOPHER:

"PRIVACY" IS AN IMPRACTICAL WAY TO THINK ABOUT DATA IN A DIGITAL WORLD SO UNLIKE THE ONE IN WHICH OUR SOCI-

SO BORED.



THE CRYPTO NUT:

MY DATA IS SAFE BEHIND SIX LAYERS OF SYMMETRIC AND PUBLIC-KEY ALGORITHMS.

WHAT DATA IS IT?

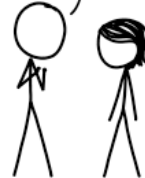
MOSTLY ME EMAILING WITH PEOPLE ABOUT CRYPTOGRAPHY.



THE CONSPIRACIST:

THESE LEAKS ARE JUST THE TIP OF THE ICEBERG. THERE'S A WAREHOUSE IN UTAH WHERE THE NSA HAS THE ENTIRE ICEBERG.

I DON'T KNOW HOW THEY GOT IT THERE.



THE NIHILIST:

JOKE'S ON THEM, GATHERING ALL THIS DATA ON ME AS IF ANYTHING I DO MEANS ANYTHING.



THE EXHIBITIONIST:

MMMM, I SURE HOPE THE NSA ISN'T WATCHING ME BITE INTO THESE JUICY STRAWBERRIES!!

OOOPS, I DRIPPED SOME ON MY SHIRT! BETTER TAKE IT OFF.

GOOGLE, ARE YOU THERE?

GOOGLE, THIS LOTION FEELS SOOOO GOOD.



THE SAGE:

I DON'T KNOW OR CARE WHAT DATA ~~ANYONE~~ HAS ABOUT ME.

DATA IS IMAGINARY. THIS BURRITO IS REAL.



I'm the Philosopher until someone hands me a burrito.

Explanation

This comic is about opinions on internet privacy in general. Six common positions are comedically presented, while serious privacy concerns are omitted. Four of the positions are tagged negatively by Randall by their subtitles alone: the Crypto Nut, the Conspiracist, the Nihilist, and the Exhibitionist, all of which have negative connotations in contemporary English. That the viewer is encouraged to identify negatively with these four positions is further encouraged by the content of the panels. The Crypto Nut is presented as having nothing meaningfully worth protecting, the Conspiracist's concerns are ridiculous and irrelevant, the Nihilist's position may come across as self-deprecating, and the Exhibitionist is presented as sexually perverse.

A fifth position, the Philosopher, is tagged somewhat ambivalently by Randall: Megan, or possibly a look-alike, is depicted as boring her interlocutor, yet in the title text, Randall admits that he is usually the Philosopher. Also, "Philosopher" in vernacular English is neutrally valenced, potentially having the ability to expound either wisdom ("sophia") or sophistry. It is also a synonym for Sage, the sixth position. As Randall condones his own movement from Philosopher to Sage, he thus indicates that the Philosopher is to be viewed negatively, even if it is a tempting position to hold.

The title of the sixth position, the "Sage", is positively valenced in contemporary English, and the author in the

title text states that once he obtains a “burrito” — i.e., a “real” thing, he switches from the Philosopher to the Sage. The internal evidence presented thus far therefore is entirely consistent; Randall encourages the reader to identify with the Sage. However, the choice of Beret Guy to represent the Sage undercuts this somewhat as Beret Guy is frequently seen as bizarrely disconnected from reality in a way that is maladaptive (e.g. 1030: Keyed) and overly obsessed with food to the point of creating trouble and potential self-harm (e.g. 452: Mission).

By presenting five negatively tagged positions followed by a positively tagged sixth and final one, the author follows a rhetorical commonplace of listing and refuting a number of positions one by one, concluding with the favored and best one, which is not refuted and should be accepted both on its own merits and by virtue of being the last one standing. The comic therefore implies that no other (significant) positions exist.

Having completed the rhetorical analysis of the comic, we are now in a position to understand the meaning of “Internet Privacy”.

Panels #3 and 5 directly reference the American NSA. Panel #5's “exhibitionist” also references Google, but the characters in the panel appear to be NSA agents (one wears an official cap and they are viewing the exhibitionist on an official, government-looking monitor). Likewise, the focus of the “Nihilist” is that the joke is on the people who gather the data, rather than those who are subsequently able to make use of it (such

as Facebook's users rather than "Facebook" itself; i.e., Facebook's employees and, by extension, its advertisers). The content of the actual data is only mentioned in panels #2, 4, and 5, and in each panel, it is suggested that it is meaningless or trivial. The Sage underscores the notion that any data known about him does not bother him, and therefore must be meaningless or trivial. The reader is thus encouraged to believe that it does not actually matter whether others discover personal data about them.

The comic is therefore what social theorists call reductive, because it reduces the range of possibilities of "Opinions on Internet Privacy" to an artificially and simplistically narrow subset; in this case, individuals concerned with government or corporate agencies using data that they have gathered on individuals, and the futility of worrying about such things. The comic does not admit the possibility of other "opinions on internet privacy" – namely, that individuals might have legitimate concerns with governmental or corporate uses of their data, let alone other individuals' access to data that is assembled and distributed by corporations such as Facebook. The comic likewise does not consider the possibility of individuals having more interesting lives than the characters depicted, and therefore very real concerns about their privacy due to the activities that they engage in that are potentially more career limiting (should they be discovered) than obsessing about cryptography or eating a burrito.

The comic is "functionally" reductive, as opposed to

“intentionally” reductive, because the reduction is the function or effect of the comic for readers who read it straightforwardly. There is not enough internal evidence in the comic to maintain that the author intentionally excluded other viable opinions on internet privacy; it could be that they are just not on his radar. For example, we do not have enough information in the comic to claim that Randall is against civil rights; it could be simply that he doesn't often think about them. Likewise, it would exceed the evidence of the comic to claim that the author believes that schoolteachers who use the internet to facilitate legal but frowned-upon sexual behaviors should lose their jobs if they are found out due to internet privacy breaches; it could be that Randall simply hasn't bothered to worry about these matters if they don't affect him personally. This adjudication – whether the comic is “intentionally” reductive or not – may only be made on the basis of external evidence; that is, data known about Randall from sources beyond this comic.

An alternative interpretation of the title text is that it is not Randall speaking his own opinion, but instead represents Beret Guy's (i.e. the “Sage's”) perspective. Randall may indeed have some concern with internet privacy, which would be consistent with the views on open-source security expressed in 463: Voting Machines, for example. In other cases, such as 1490: Atoms and 1419: On the Phone, the title text has been used as additional, farcical statements made by characters in the strip, rather than as Randall expressing his own views.

Under this interpretation, Beret Guy would be prone to philosophizing about security, but then be easily distracted by a burrito; this is consistent with Beret Guy's general behavior.

Additional observations about the comic follow.

- The Philosopher - the intellectual who likes to talk about the topic, often boring those around him who don't think or worry much about privacy.
- The Crypto Nut - the one who goes crazy with security, even for things needing none.
- The Conspiracist - the one who sees super-secret data-gathering agencies everywhere.
- The Nihilist - Nihilists believe that life lacks purpose and meaning. Someone who espouses this philosophy would think that a life spent spying someone else's meaningless life is hence doubly lacking in meaning.
- The Exhibitionist - Assumes people are invading his privacy, and using it to show off.
- The Sage - Seems to know the difference between the real and the imaginary - or does he?

The release of the comic on this date could be to coincide with the premiere of South Park's 17th season on the same date, which starts with an episode (Let Go, Let Gov) in which Cartman discovers that the NSA has been spying on him.

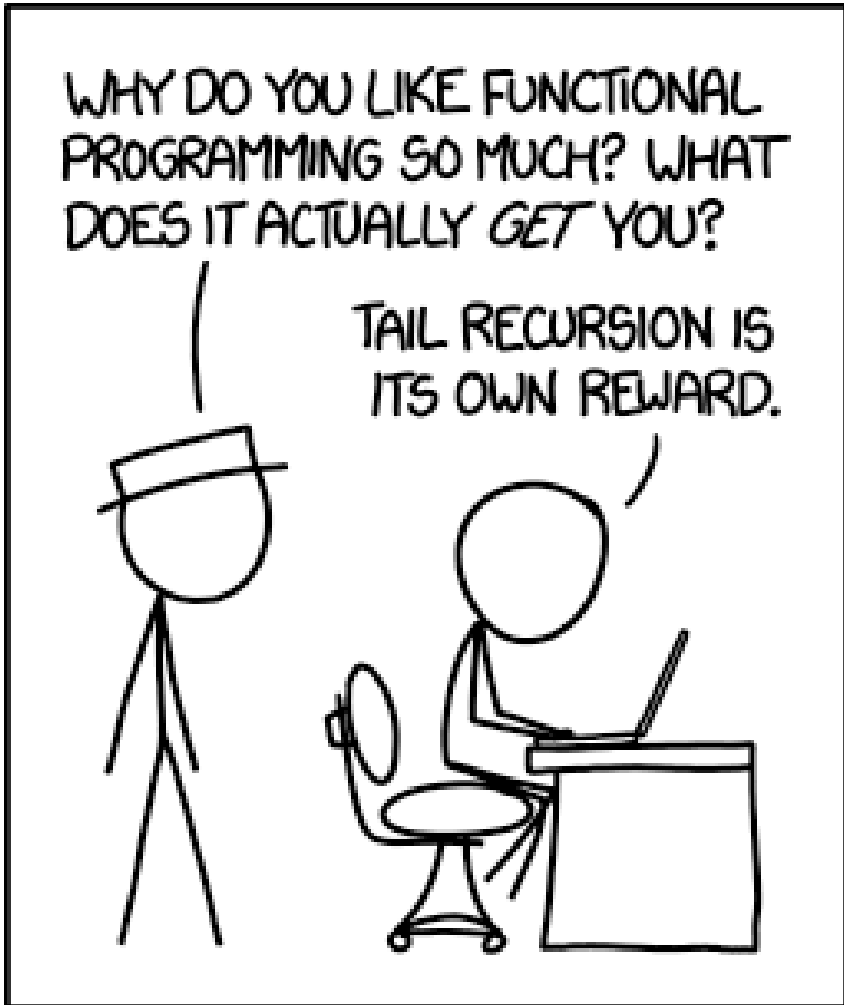
Reasons to care about privacy may not apply directly and currently to the characters in the comic. Demographics

that may be targeted by state violence (like sexual minorities under Nazi Germany) have valid privacy concerns, as do political opponents of a state (like communists during McCarthyism). The Exhibitionist presents a comedic inverse of another reasonable privacy concern: that people you don't know (voyeurs) are getting off from secretly watching you.

The title text is to suggest that he enjoys burritos so much that being handed one even while philosophizing (his natural state) would stop him in his tracks to eat the burrito, thus becoming a pseudo-sage concerned only with the burrito at the exclusion of the topic of internet security. The burrito is later mentioned as a way to stay connected to the real world (compared to the world of art) in 1496: Art Project.

#1270: Functional

September 27, 2013



Functional programming combines the flexibility and power of abstract mathematics with the intuitive clarity of abstract mathematics.

Explanation

White Hat questions Cueball's faith in functional programming. Cueball responds saying, "Tail recursion is its own reward."

Functional programming is a paradigm of computer programming with roots in Lambda Calculus. Core tenets of functional languages often include: function application and composition, declarative syntax, immutable data structures, and mathematically pure functions. Functional programming often uses recursive functions to serve the same purpose that loops serve in other programming languages. A recursive function calls itself again, typically with slightly different arguments. E.g., the following factorial function is recursive because it calls itself again for any argument value n greater than 0.

Tail recursion is a particular sort of recursion that often compiles into more efficient code (see the longer explanation below), but the differences between tail recursion and other sorts of recursion aren't important to the humor of this comic.

The comic is a pun on two readings of "Tail recursion is its own reward". The expression "X is its own reward" often is used to suggest that X is intrinsically valuable in its own right. Some (but not all) programmers and mathematicians find recursive functions elegant and intrinsically pleasing, so would take tail recursion to be

its own reward in this sense. Since recursive functions call themselves again, and make use of the resulting values, there is also a sense in which recursive functions also serve as their own "reward" - i.e., the recursive function itself returns the values that the function requires to perform its tasks. So even if you don't find tail recursion intrinsically pleasing, there is still this technical sense in which it is its own reward anyway.

The title text is humorous in part because it violates two expectations. First, expressions of the form "X combines some trait of Y with some trait of Z" usually talk about combining traits of two different things (i.e., Y is not equal to Z) whereas this text surprises the reader by having "abstract mathematics" occupy the role of both Y and Z. And second, such expressions usually list two positive traits. The first listed trait (the "flexibility and power of abstract mathematics") is pretty clearly positive. However the second trait (the "intuitive clarity of abstract mathematics") is less clearly positive. Many people actually find abstract mathematics to be quite lacking in intuitive clarity, and for much the same reasons many people often find functional programming also to be lacking in intuitive clarity. So the title text invites the reader to puzzle over whether it really is a positive thing for functional programming to be able to claim to match the "intuitive clarity of abstract mathematics", or whether Randall might instead have just smacked functional programming with a funny backhanded compliment. Another explanation is that the fact that that part of the title text is confusing is a

metaphor for the fact that abstract mathematics and functional programming can be confusing, and the first part of the title text is flexible because it can be applied to a wide variety of situations with different things filling in the blanks for X, Y, and Z, and it's apparently powerful because it's used in marketing a lot,[citation needed] so advertisers must feel that it will have a powerful effect.

Further explanation[edit]

Functional programming is a famous paradigm (or style) in modern programming that favors functions that can be evaluated like mathematical functions, i.e., functions are "evaluated" (executed) to return a value (their output) which exclusively depends upon the values of their arguments (their inputs). Imperative programs, by contrast, often make use of one or more variables that are external to the function that is currently executing. This means that an "imperative function" may return a different result for the same input due to changes in a non-local variable, whereas a "pure function" will always return the same result for a given input; however, in practice some functional programming languages also support non-local variables.

Additionally, for similar reasons, functional programming systems often strive to eliminate or at least rigorously encapsulate (contain) so-called "side effects"; i.e., "functional-style" functions should have absolutely no effect on anything other than their return value. This is to say, in well-designed "functional-style" computer code, all functions, or as many as is practicable, should be stringently self-contained, their behaviour should depend entirely and exclusively upon their written definition and the values of their arguments, and they should be totally unable to

affect anything else in the program except via their explicit return value.

This is directly contrary to the imperative programming paradigm, where functions are often designed and invoked especially for some ulterior effect that will eventuate when they are executed; some "imperative-style" functions even have no return value, and exist purely because running them is known to cause some other desired result. In functional programming, these are not considered functions at all, but rather "procedures", and the difference between functions and procedures is quite strong; some languages which are purely functional do not admit procedures as valid parts of the language at all.

Unlike procedures, functions always return a value. For example, $\sin(x)$ returns 1 when x is 90° . Furthermore, the function may call itself (usually with slightly different parameters), thus effectively starting a loop. This is called recursion.

In order to iterate, imperative programs usually use loops. Functional programs usually use recursion instead.

For example, the factorial function (e.g. " $\text{factorial}(5) = 5 \times 4 \times 3 \times 2 \times 1$ ") can be coded imperatively as:

An imperative, recursive (but not tail-recursive) implementation can look like this:

In this situation, the recursion stops when the argument (n) is not greater than zero. Without the conditional definition, it would be an infinite loop. Tail recursion is a special case of recursion whose very last operation is to invoke the function itself or return a definite value. The previous example is not tail-recursive, since

after the call to "factorial(n-1)", the returned value has to be multiplied by n.

This (functional) example is tail recursive inside the helper function:

e.g.

In functional programming, tail recursion is detected by the compiler or interpreter and can be executed as efficiently as loops in imperative programming languages. This makes tail recursion an essential programming technique in functional programming.

Cueball is making a play on words where "Tail recursion is its own reward" is used both in the sense that it is worth doing on the grounds of being elegant and intellectually satisfying alone, without the programmer having to "actually get" anything from it, as well as in the sense that the 'tail call' of a function is its final step, and is the final step (and hence the result/reward) for all levels of a tail-recursive function.

The title text suggests that to the mathematically minded functional programming may be both powerful and flexible as well as intuitive and clear since it very closely approximates the way mathematicians ordinarily think about general recursive functions. The implicit humorous contrast is that, to many (possibly most) others, including many software engineers, functional programming can seem abstruse or highly unobvious for the exact same reason, because it closely approximates abstract mathematical logic rather than the mechanistic, stepwise logic valued in the imperative programming style. It is also a reference to a common saying among functional programmers about the

imperative programming language, 'C': "C combines the flexibility and power of assembly language with the user-friendliness of assembly language", which is a humorous take on the original saying "C combines the flexibility and power of assembly language with the user-friendliness of a high-level language".

#1271: Highlighting

September 30, 2013



I ABSENTMINDEDLY SELECT RANDOM BLOCKS OF TEXT AS I READ,
AND FEEL SUBCONSCIOUSLY SATISFIED WHEN THE HIGHLIGHTED AREA
MAKES A SYMMETRICAL SHAPE.

And if clicking on any word pops up a site-search for
articles about that word, I will close all windows in a panic
and never come back.

Explanation

A number of people find it easier to read long texts by marking their place as they move through the reading. When done on paper, this may be done with a ruler, pencil, or finger. On-screen, however, one of the most effective methods is by highlighting the text being read. People accustomed to this form of reading often do it absentmindedly. Some people simply highlight parts of an article they're consulting without regards to which line they're currently reading, just to occupy their hands.

Highlighting, however, has the potential to create shapes on screen. Randall is referring to the fact that the shapes created may occasionally be symmetrical, which creates satisfaction. Different highlighting patterns may be caused by the user's browser, the site provided, or by simply dragging one's cursor across the screen with the mouse button held down, and releasing at different patterns..

The top example shows tight-fitting highlight syntax, which only covers the text of the paragraph. This is the most common result of highlighting an entire paragraph, but as paragraphs are rarely symmetrical, this example is marked by an X.

The second example starts the highlighting a few words in and continues to the end of the paragraph, while the third example begins another half-word in and continues down a line and a word before ending. Both of these

patterns would be caused by manually highlighting the text with the mouse button, rather than rapidly-clicking until a segment is highlighted. The second example forms a square where the three lines of highlighted text overlap, while the third has rotational symmetry of the selected region; both are marked with checks.

The fourth example highlights the entire paragraph, as well as the whitespace caused by the indentation of the paragraph and at the end of the paragraph when the last line does not continue to the opposite margin. This example has both rotational and divisible symmetry, and is marked with a check.

The fifth example highlights the whitespace after the end of the paragraph, but not the whitespace of the indentation, leaving an odd block at the start of it. This ruins the paragraph's symmetry, and so this example is marked with an X.

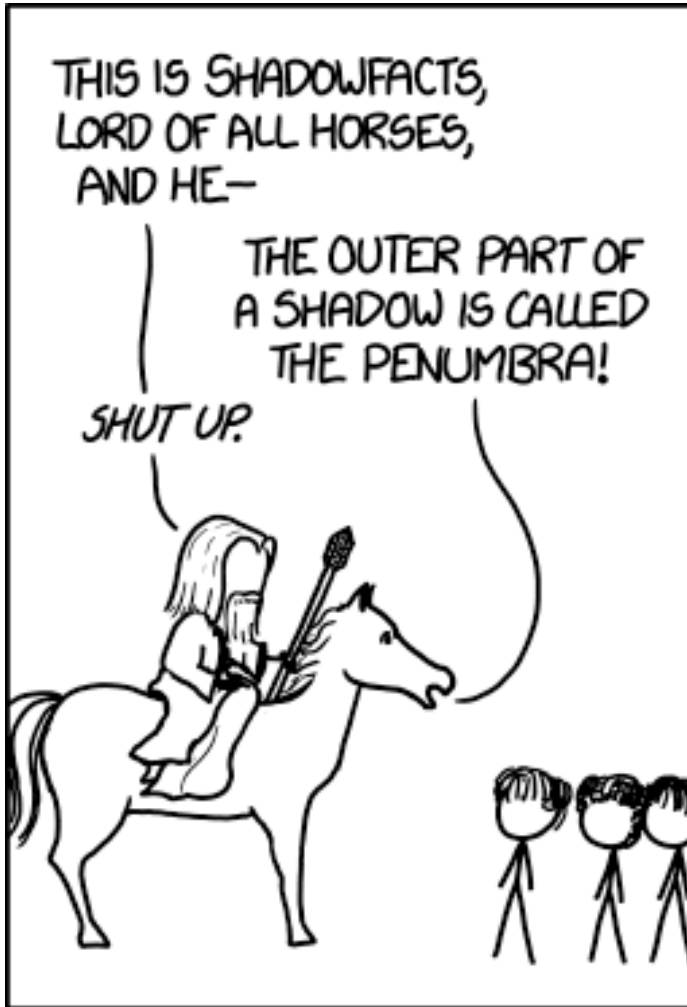
The bottom example refers to the practice of websites adding a script to disable highlighting, often to discourage readers from copying their content. This creates a great dissatisfaction in readers accustomed to highlight as they read, shown by the many overlapping "X"s. Ironically since the comic is an image, the text in the comic can also not be highlighted.

The title text refers to the practice of websites of adding a script that searches upon clicking any word in the text; most notably done by Yahoo! news in years prior. The search may be of the site, the web, or of an advertisement

provider. The script sometimes creates a popup, which, Randall says, causes him to "panic", and consequently never want to return to the site again. It is in fact quite annoying to the occasional highlighter, causing them to lose their place and interrupting their train of thought.

#1272: Shadowfacts

October 02, 2013



'Look to my coming on the fifth day. At dawn, look to the east.' 'And look to the west to see our shadows!'

Explanation

This comic is a parody of J.R.R. Tolkien's *The Lord of the Rings*. The name of the horse, Shadowfacts, is a pun on Shadowfax, the horse Gandalf rides in the books. As the name "Shadowfacts" suggests, this horse interjects into conversations various facts about shadows, much to Gandalf's annoyance. There is a possible deeper level to the pun, referring to the cat facts meme.

The three parts of a shadow are the umbra, penumbra and antumbra.

In the title text, Gandalf continues to speak, and is interrupted again by the horse with another fact about shadows. "Look to my coming on the fifth day. At dawn, look to the east." is what Gandalf said before the battle of Helm's Deep when he went to get reinforcements. The horse notes that if the sun is in the east, the shadows will be to the west of the objects that cast them, which isn't particularly useful in this scenario.

A similar talking horse appears in 936: Password Strength.

#1273: Tall Infographics

October 04, 2013



'Big Data' doesn't just mean increasing the font size.

Explanation

This comic is a satirical infographic, which is usually used to simplify and help visualize information that would be dreadfully boring otherwise. Randall takes this "simplification" to the extreme by making an unhelpful infographic, complete with unnecessary data and ironic and blatant misuse of common graphs and charts. At this point, he is not even simplifying his sentence "By the year 2019, all information will be communicated in this clear and concise format." He makes a sarcastic claim, pointing out how needlessly complicated some infographics make things they are supposed to condense.

In the chart:

- The number 2019 is huge and placed between the numbers 2018 and 2020, which is bordering on extraneous considering that the fact that 2019 precedes 2020 and succeeds 2018 is blindingly obvious.[citation needed]
- The graph of information represented by this format is extrapolated off of and intersects with 100% at 2019. This is a running joke on xkcd and is ridiculous for multiple reasons, as shown in 605: Extrapolating and 1007: Sustainable, for example.
- The word "information" has the letters "info" highlighted differently for the typical abbreviation despite the text splitting after the "r", a rather silly graphical styling.

- A pie chart, with one part labeled "will" and one part labeled "be", which is completely nonsensical as pie charts show the proportional relationship of parts of a whole (for instance, people up to 30 years old and over 30 years old in a human population), and "will" and "be" are merely words and the chart isn't showing their proportional representation in a population. It may be showing the proportional length of each word in a sentence, though this could also be accomplished by showing both words in a normal sentence.
- "6 years from now" is more blindingly obvious fact at the time (2013).
- "72 months" is an unneeded and obvious conversion from six years; it is also false precision as 2019 (January 1) arrives 63 months from the comic date. The word "months" is also split across two lines, mid-syllable.
- A corny illustration of Megan telling Hairy the word "communicated" and Hairy enthusiastically responding "Yes!", despite the absurdity of the situation.
- The word "this" in huge font, and the word "in" with a bracket, taking up an inordinate amount of space.
- A Venn diagram. As anyone who has seen a Venn diagram knows, the two circles are two concepts or qualities, and objects or concepts that fit inside the circles go within. The words "clear and concise" plastered across the Venn diagram have absolutely nothing to do with Venn diagrams, and are ludicrously inappropriate for this jumbled and overblown presentation, but the word "AND" is in the intersection

of the two circles, which is meta-humorous.

- In the lowermost bar graph, the bar height shows the alphabetic position of each letter of the word FORMAT (the bar labeled "F" has a height of 6, the "O" bar has a height of 15, etc.), with 'T' highlighted because it is the highest. And possibly because the bars for the other letters form a visually pleasing 'arc'-segment, leaving the 'T'-bar as a statistical outlier deemed 'worthy' of note.

It is also likely that this comic is a send up of the recent trend towards presenting information in tall graphics that are easily viewed on smartphone screens. A tall graphic with the same pixel width as an iPhone, for example, can be viewed without zooming and using only vertical scrolling. Another discussion venue for the topic and this comic is Gizmodo: Tall Infographics Suck.

The prediction communicated in the comic did not actually happen by the year 2019. Alternatively, it did happen but was reversed so quickly nobody noticed it happened. However, in the 2020s, the rise of tiktok and vertical short form video has led to more and more information being communicated in a tangentially similar format.

The title text mentions the often-hyped term "big data." "Big data" normally refers to the challenges of working with and visualizing a quantity of data which is hard to process using traditional tools and methods. Randall, now speaking unsarcastically, tells us that just because the font size is huge doesn't mean you have handled the

big data well.

#1274: Open Letter

October 07, 2013

OCTOBER 7TH 2013

TO: THE FREEMASONS, THE ILLUMINATI, SCIENTOLOGY, FEMA,
THE NEW WORLD ORDER, THE FEDERAL RESERVE, CITIGROUP,
HALLIBURTON, GOOGLE, THE VATICAN, BILDERBURG, WALMART,
THE ROTHSCHILDS, THE KNIGHTS TEMPLAR, HAARP, THE UN,
SKULL & BONES, BOHEMIAN GROVE, THE KOCH BROTHERS,
GEORGE SOROS, THE TRILATERAL COMMISSION, THE KNIGHTS
OF MALTA, THE CFR, EXXON MOBIL, THE ZIONISTS, THE
VRIL SOCIETY, THE LIZARD PEOPLE, AND EVERYONE ELSE
WHO SECRETLY CONTROLS THE US GOVERNMENT

CAN YOU PLEASE GET YOUR SHIT TOGETHER?
THIS IS EMBARRASSING.

SINCERELY,
A CONCERNED CITIZEN

Are you ok? Do you need help?

Explanation

This comic is a reference to the US government shutdown in 2013 that had been ongoing for a week and was still current as of the time of this comic. Under some circumstances, the United States Federal Government can temporarily shut down pending budget legislation being passed by the United States Congress. These shutdowns are typically due to political disagreements between the President, the House of Representatives, and the Senate. Due to the shutdown, numerous government services and facilities are shut down, often resulting in many logistical issues for the public.

Over the years, various conspiracy theories have been proposed claiming that the United States Government is not controlled by publicly-elected officials, but rather by one or more organizations that secretly control the actions of the government (sometimes termed a "shadow government"). In this strip, Randall writes a letter to the shadow government, telling them that the situation (having the country's government shut down) is embarrassing and asking them to fix the problem.

This comic also implicitly argues against the plausibility of the aforementioned conspiracy theories if one assumes that a shadow-controlled government would be more likely to operate with a singular purpose and therefore be less susceptible to paralyzing political disagreements. Randall previously alluded to this in the title text to comic 1081: "Really, the comforting side in most

conspiracy theory arguments is the one claiming that anyone who's in power has any plan at all." This is one of several comics in which Randall expresses dismay at how many intelligent people can fall for absurd conspiracy theories; see comics 258: Conspiracy Theories and 690: Semicontrolled Demolition, among others.

The title text addresses the leadership of the shadow government in more colloquial terms, asking if they are suffering from personal problems that are impeding their ability to keep things under control. This is patronizing, and thus hilarious.

The message, as titled, is in the form of an "Open Letter", being a directed and 'personal' message to a person or group of people which is nonetheless intended by the sender to be publicly aired (unlike a standard commentary or editorial, which is intended for public consumption, but addresses the concerned 'target' almost as an aside). In some cases this may be to ensure the correspondence is not kept confidential by the recipients and/or that the public as a whole are also indirectly addressed ('Cc'ed) in the correspondence, without having to compose a companion piece for that purpose. In this case, however, it may additionally be because the intended recipient(s) are not so easily identified for direct communication, and a public airing would ensure 'delivery' even without compromising the integrity of the message. Open Letters are often aired (or pre-copied, verbatim, from actual correspondence) in one or area or other of the public media, and while web-comics aren't necessarily the most publicised of forums, the xkcd

readership almost certainly leads to covering both the 'named' recipients and the intended public view.

Addressees[\[edit\]](#)

#1275: int(pi)

October 09, 2013

$$\text{VOLUME}(R) = (4/\text{INT}(\text{PI})) * \text{PI} * R^{\text{INT}(\text{PI})}$$

PROGRAMMING TIP: THE NUMBER "3" IS CURSED. AVOID IT.

If replacing all the '3's doesn't fix your code, remove the 4s, too, with 'ceiling(pi) / floor(pi) * pi * r^floor(pi)'. Mmm, floor pie.

Explanation

This comic purports to provide a tip to programmers, that the number "3" is cursed and shouldn't be used. There is no explanation given as to why the number 3 is cursed, and it could well have been chosen arbitrarily. The title text hints that the consequence for using the cursed number is non-functioning code, a pain for any programmer. The absurdity of the number 3 somehow being cursed is part of the humor.

To assist the programmer, the comic gives an example of how to avoid the use of the number 3, by using a slightly convoluted method of using $\text{int}(\pi)$, which means the integer part of π , without the fractional part. π , an irrational number, has a value starting 3.14159..., making $\text{int}(\pi)$ equal to 3. This is demonstrated in a formula to calculate the volume of a sphere, normally $(4/3) \cdot \pi \cdot (r^3)$, but converted for avoidance of the number 3 to $(4/\text{int}(\pi)) \cdot \pi \cdot (r^{\text{int}(\pi)})$.

For a number of reasons it is a good programming practice to use variables and constants where a value is used in multiple places, however this is not typically used in the case of natural numbers. There are unusual situations where this type of programming is a valid method, however typically for more specific circumstances, and not a certain number being seen as cursed.

In the title text, Randall takes the joke a step further,

suggesting the usage of floor and ceiling functions: `ceiling(pi)` would be `pi` rounded up to the next integer, which is 4; and `floor(pi)` is `pi` rounded down to the next integer, which is 3. (Note that `int(n)` and `floor(n)` have the same value when `n` is greater than or equal to zero. For values less than zero, `int(n)` is equal to `ceiling(n)`.)

The joke here plays on the fact that basic rules of programming are confusing and novice programmers are often told to simply not do certain things without any explanation (see 292: `goto`). This includes, in particular, a general proscription against "magic numbers" in the code. Replacing all significant magic numbers with named constants makes programs easier to read, understand and maintain. Randall takes this to an extreme by suggesting that certain numbers could be inherently problematic, but the general idea is perfectly believable.

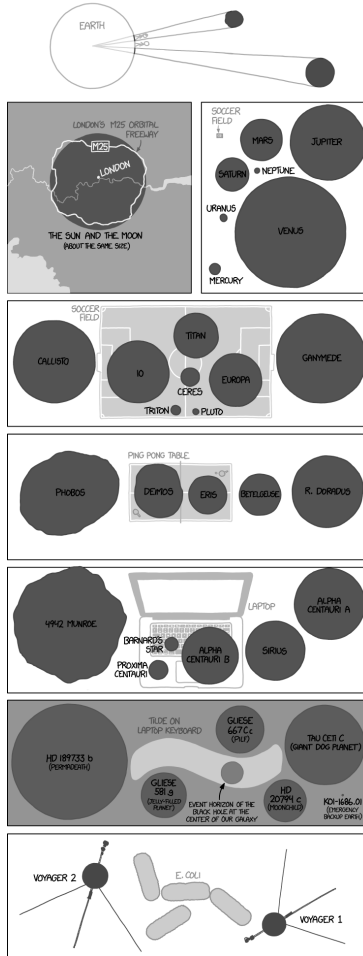
Mmm... Floor pie. is a reference to The Simpsons.

See also Cargo cult programming.

#1276: Angular Size

October 11, 2013

THE SIZE OF THE PART OF EARTH'S SURFACE
DIRECTLY UNDER VARIOUS SPACE OBJECTS



If the celestial sphere were mapped to the Earth's surface, astronomy would get a LOT easier; you'd just need a magnifying glass.

Explanation

This comic is a comparison of the angular diameters (or apparent diameter) of various celestial objects at the surface of the earth relative to a vertex at the center of the Earth as diagrammed in the opening panel. The objects' scales are compared to actual objects on earth. Each size given is for the object at its closest approach to earth.

London's M25 motorway is around 60 kilometers (35 miles) across, a soccer field is about 100 meters long (109 yards), a ping pong table is 274 centimeters long (9 feet), a laptop is about 35 centimeters across (13.75 inches), the tilde symbol on a keyboard is about 5 millimeters long (197 mils), and a cell of E. coli is about 2 micrometers long (78.75 millionths of an inch).

A simple formula can be used to find the size on earth of a celestial object when the size of or distance to the object is known. This is done by taking the radius of the earth, multiplying by the diameter of the object, and dividing by the distance to the object from the center of the earth.

The space objects referenced in the panels are:

- The Sun and the Moon, and also the open cluster Messier 25, have approximately the same size (around 0.5 degrees of arc) when seen from the Earth.
- Mercury, Venus, Mars, Jupiter, Saturn, Uranus, and Neptune are the other planets of the Solar System.
- Io, Europa, Ganymede, and Callisto are the main

moons of Jupiter; Titan is the largest moon of Saturn; and Triton is the largest moon of Neptune. Ceres and Pluto are dwarf planets.

- Phobos and Deimos are the moons of Mars. Eris is another dwarf planet. R Doradus and Betelgeuse are giant stars, respectively around 180 and 640 light-years away. R Doradus is the star with the largest apparent diameter (other than the sun, of course).
- 4942 Munroe is an asteroid named after xkcd author Randall Munroe. Proxima Centauri, Alpha Centauri AB, Barnard's star and Sirius are nearby stars (all within 10 light-years from the Sun).
- HD 189733 b, Gliese 581 g, Gliese 667 Cc, HD 20794 c, Tau Ceti c, and KOI-1686.01 are extrasolar planets; the parenthetical names are references to the comic 1253: Exoplanet Names. However, some of the planets' parenthetical names do not match the table in the previous comic. For example, HD 20794 c is called "Legoland" rather than "Moonchild" in 1253: Exoplanet Names. The black hole at the center of our Galaxy is Sagittarius A*, a massive object containing a mass more than 4 million times of our Sun.
- Voyager 1 and 2 are space probes launched in 1977, and currently around 125 and 100 astronomical units away, respectively.

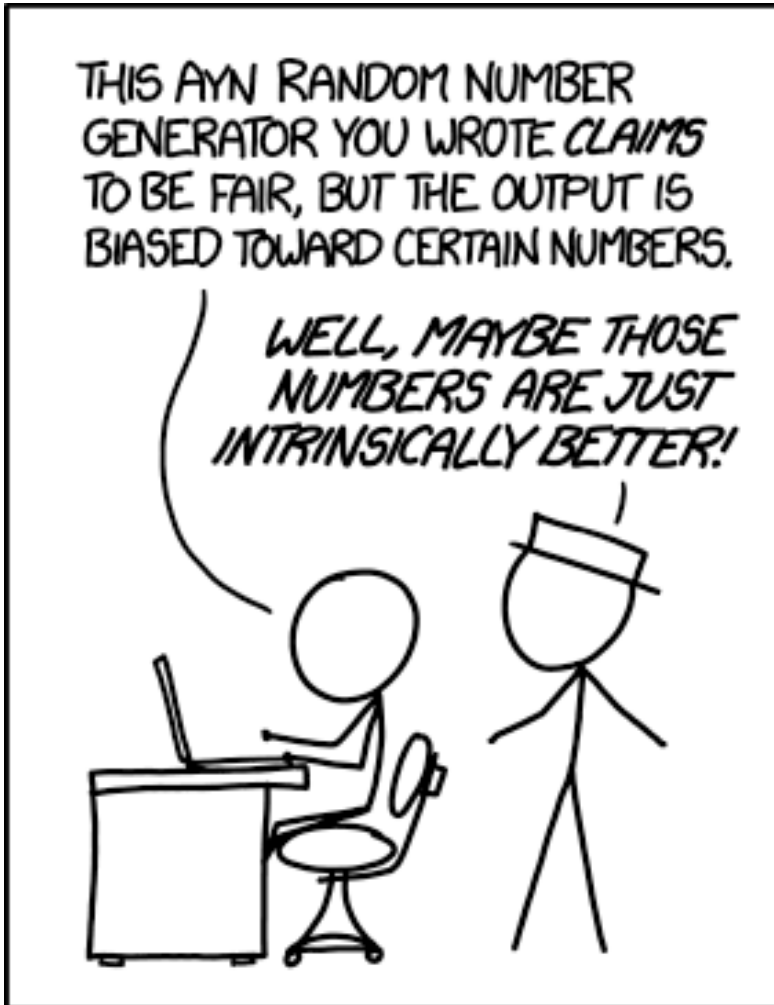
The title text states that astronomy would be much easier if the celestial sphere were mapped to the earth - like a giant globe. Due to the distance of the stars you would just need magnifying glass to see the areas representing

distant stars instead of an expensive powerful telescope to see huge distances.

Approximate values for the mappings to the Earth sphere (based on mean Earth radius at 6,371.0 km or 3,958.8 mi.):

#1277: Ayn Random

October 14, 2013



In a cavern deep below the Earth, Ayn Rand, Paul Ryan, Rand Paul, Ann Druyan, Paul Rudd, Alan Alda, and Duran Duran meet together in the Secret Council of $\sqrt{(b[\text{plurandy}] + b \text{ ?})^2 / i}$.

Explanation

This comic is a satirization of Objectivism, a philosophy developed by Ayn Rand. Objectivism is a moral system which promotes the institution of complete, unregulated Laissez-Faire capitalism (capitalism with no regulation or governmental intervention of any kind). A core claim of Objectivism is that it is a perfectly fair way of distributing resources. Depending on how one defines fairness, Objectivism is not fair -- since those who have been externally elevated to an advantageous position (e.g. via nepotism) will be able to acquire more resources with the same level of effort as another person who does not benefit from similar advantages. In the comic, this juxtaposition between the claim that Objectivism is fair, and the unfairness seen in its practical implementation, is satirized in the form of an Ayn Random number generator (a pun on Rand's name) whose creator claims is perfectly fair but demonstrably is not.

A major ethical quandary Objectivists face is what is to be done about this unfairness; if Objectivism really is the perfect system for resource distribution, then why are resources distributed unequally under Objectivism? How one answers that question depends on a certain assumption -- that being, whether all humans are essentially equal in value (the accepted moral position in the West, c. 2024) or not. Some Objectivists disagree with the assertion of total human equality, concluding that if, under a hyper-aggressive survival-of-the-fittest system, people do not acquire equal levels of resources,

then peoples' intrinsic values must be different. In the comic, this particular position is satirized with White Hat's cry of "Well, maybe those numbers are just intrinsically better!"

A more nuanced description is that Objectivists believe that the primary aim of life is to maximize personal happiness. In their view, if some humans are born more capable of satisfying their desires than other people, they deserve to reap greater rewards from life than others, no matter the cost to those others.

As an aside, "biased" random number generators exist. They're called weighted random number generators, and they have many practical applications when the programmer isn't lying about the number generator's function and output.

The title text identifies a group of people whose names match the regular expression `/(\b[plurandy]+\b ?){2}/i`. A step-by-step explanation of the expression:

- `\b` is a word boundary, matching anywhere there is a 'word character' next to a non-word character—punctuation, digit, spacing, etc.
- `[plurandy]` is a character class, and will match any single character from the set inside the square brackets; `[adlnpruy]` means exactly the same
- the plus sign means one or more of the previous thing, so `[plurandy]+` matches one or many of the characters in that class, one after the other

- " ?" - a space followed by a question mark: "?" means "0 or 1 of the previous thing", so a space is optional
- the whole section in parentheses (`\b[plurandy]+\b ?`) translates to "a word containing one or more letters, all of which are in the set [plurandy], followed by an optional space"
- the {2} on the end means to repeat the pattern, so it must match exactly twice
- The slashes at each end mark out the pattern, and the "i" at the end is an expression qualifier means it is "case insensitive" (uppercase and lowercase match interchangeably)

Overall, it matches two words separated by a space, composed entirely of the letters in [plurandy], which is what all the names listed have in common. This could suggest that those letters are, to quote White Hat, intrinsically better.

As an aside, if the entirety of the title text is matched against the regular expression, it matches "and Duran" instead of "Duran Duran".

Speculation[edit]

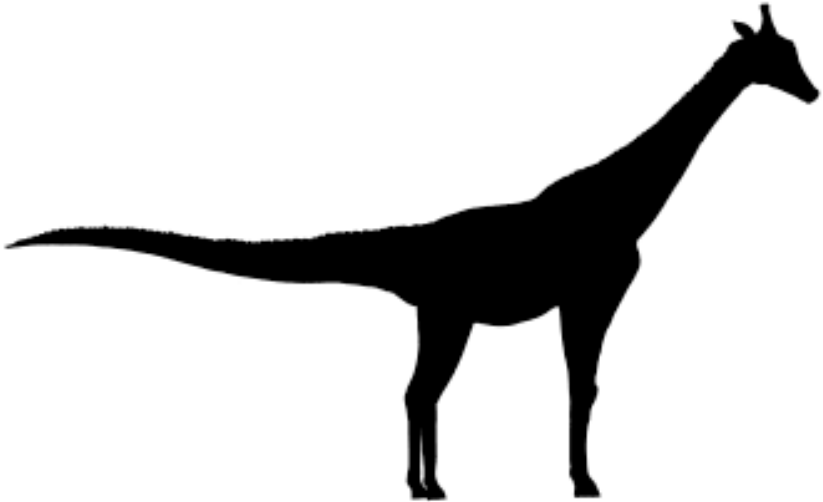
Since the primary virtue in Objectivist ethics is rationality (or, at least, "rationality" as defined by Rand: her critics argue that the conclusions she reached do not actually derive inevitably from her premises and that additional, unstated assumptions are necessary to make the system work), the implication may be that the random number generator favors rational numbers (numbers that can be written as a fraction, i.e. a quotient p/q). On the other

hand, given computers cannot store data of unlimited length, it is impossible for any real world computer random number generator to produce an irrational number in any of the usual integer or floating point representations—so probably not. (Although a computer could encode irrationals or generate them randomly if it uses another representation, one of the standard algebraic number representations, for instance.) Alternately, an Objectivist might argue that if the intent of the comic is to attack or mock Objectivism, then the comic inadvertently satirizes itself via the "rationality" interpretation.

#1278: Giraffes

October 16, 2013

MY HOBBY:



CONVINCING GENETIC ENGINEERS THAT GIRAFFES
WOULD LOOK BETTER IF THEY HAD SAUROPOD TAILS

If you fund my Kickstarter ...

Explanation

Genetic engineering is the scientific approach towards altering and modifying the genome of organisms. In the process, DNA material is extracted from a source organism and then inserted into the genome of a host organism. It is thus possible to create hybrids between species that would not crossbreed naturally. The technique is also applied in order to expedite the sometimes lengthy process of selective breeding.

The comic suggests the creation of genetically modified giraffes. Following the recurring theme in the comics that dinosaurs and dinosaur-like traits make life more interesting, Randall expresses his desire to see genetic engineers insert DNA from extinct sauropods into the giraffe's genome, resulting in giraffes with very large and thick tails. Randall has previously shown great interest in dinosaurs and their integration into the modern age. It is possible that Randall wishes to combine the two due to the fact that they'd look very "cool" together as they are both seemingly weird animals. Giraffes are distinctive for their extremely long neck and sauropods have extremely long tails; the drawing would indicate that the giraffe's neck and sauropod's tail are of equal height/length, thus creating a bizarrely satisfying sense of symmetry.

The idea of extracting and reproducing DNA material of dinosaurs appears most prominently in the 1993 motion picture Jurassic Park. The concept is regarded by scientists as rather implausible because DNA

disintegrates soon after the death of the organism (read: around 500 years) and would not be preserved in fossils.

Furthermore, the science of genetic engineering is not yet able to accomplish major alterations in complex genomes. While mice and other small vertebrates have successfully been modified for research purposes, the daily use of genetic engineering is limited to plants and monads. That besides, the less closely related the starting species are to each other, the more difficult it would be to successfully combine them. So while the field of genetic engineering is always advancing, combining the body of a modern-day mammal with the tail of a dinosaur will remain a pipe dream for a long time yet. (Also, there are no known cases of preserved non-avian dinosaur DNA being discovered, and current chemistry knowledge indicates that no DNA can survive over 1 million years.)

In general, genetic engineering is a highly controversial topic with regards to the responsibility of science. While some praise the scientific progress and welcome the possibilities it brings, others fear that genetic science might enable man to alter the ways of nature and to presume the role of an almighty creator. The creation of hybrid animals (so called Chimeras) is often regarded as the ultimate hubris and the climax of moral decay. Some countries have therefore installed strong legal restrictions for the modification of genetic material extracted from humans and animals.

The title text refers to Kickstarter, a funding platform for creative projects. Any person who wants to start a

creative project, but lacks the resources to do so, can create a Kickstarter campaign where donors can contribute donations. Usually, the owner of the Kickstarter promises exclusive benefits to donors of certain tiers. For example, the title text could well be finished to say If you fund my Kickstarter with a donation of \$20 or more, I will give you exclusive access to my weekly blog on the development stages of the giraffosaurus. If you donate \$100 or more, you can receive a life-sized cardboard cut-out of the giraffosaurus. Donations of \$10,000 or more will earn your name in a raffle for ownership of the first three giraffosauruses. This may also be a reference to 1055: Kickstarter.

While dinosaurs are a recurring trope since the beginning of xkcd, giraffes have been featured in some what-if articles as a measurement of height.

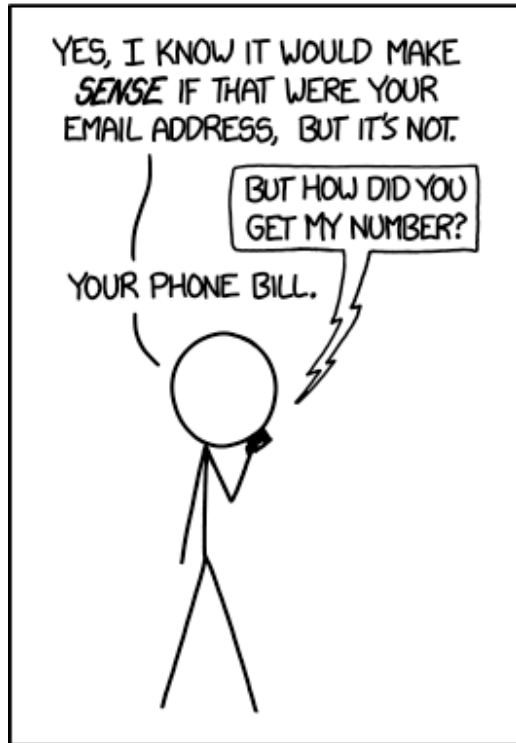
Interestingly enough, there seems to have been a species of sauropod dinosaur that bore a certain likeness to the modern giraffe and has therefore been christened Giraffatitan.

#1279: Reverse Identity Theft

October 18, 2013

IF YOUR EMAIL ADDRESS IS
[FIRST INITIAL] + [LAST NAME]
@GMAIL.COM

YOU GRADUALLY GET TO KNOW
LOTS OF OLDER PEOPLE WHO
HAVE THE SAME NAME PATTERN



I asked a few friends whether they'd had this happen, then looked up the popularity of their initials/names over time.

Based on those numbers, it looks like there must be at least 750,000 people in the US alone who think 'Sure,

that's probably my email address' on a regular basis.

Explanation

Identity theft is the criminal method of assuming the identity of an unsuspecting person, usually to get credit in their name. While this is done deliberately, the comic introduces the idea of reverse identity theft: An older person with little knowledge of computers involuntarily uses another person's email address because they supposed it to be their own. Since most email addresses follow a generic pattern, they simply adapt the pattern to conform with their own name, unaware that someone with the same initial and last name already owns the address.

Most internet users face at some point the message that their desired email address is "already taken". Because email addresses must be unique and only a limited set of characters is allowed, people with common names usually add numbers to their name. The comic suggests that elder people might easily forget that they had to take, for instance, when they signed up. Instead, the person would tell everyone that their address was , since that follows the generic pattern and is the most intuitive assumption for them. They are in complete ignorance that the address belongs, in fact, to whomever claimed it first. In this case, the address belongs to Randall himself. (In case you're wondering, yes, is Randall's email according to the xkcd blog.)

The comic has Cueball call an older person, who

apparently gave Cueball's email address to the phone company, which now emails Cueball the bills - this could have been avoided if said company confirmed an email address first. The person is not able to understand why this is not their email address (as it corresponds with their name) and is also very confused how Cueball got their phone number. The latter reveals a major problem of reverse identity theft: Using another person's email address for your own business matters exposes your own identity. The owner of the address could easily take advantage of the situation, leading to a scenario of regular identity theft. Fortunately, Cueball seems to be more honest; Black Hat probably would not have given any warning.

Due to the sheer mass of people online, nearly all simple nicknames are already taken; and the number of possible combinations is further diminished by services (e.g., Gmail) which ignore the dot sign altogether and does not allow the use of hyphens or underscores. This policy is designed to prevent fraud, but it forces users to add numbers or other unique identifiers to their names. Apart from the scenario addressed in the comic, another subsequent problem is the use of wrong email addresses by third parties. Someone sending sensitive personal information to the wrong recipient can just as easily expose a person's identity as the person themselves.

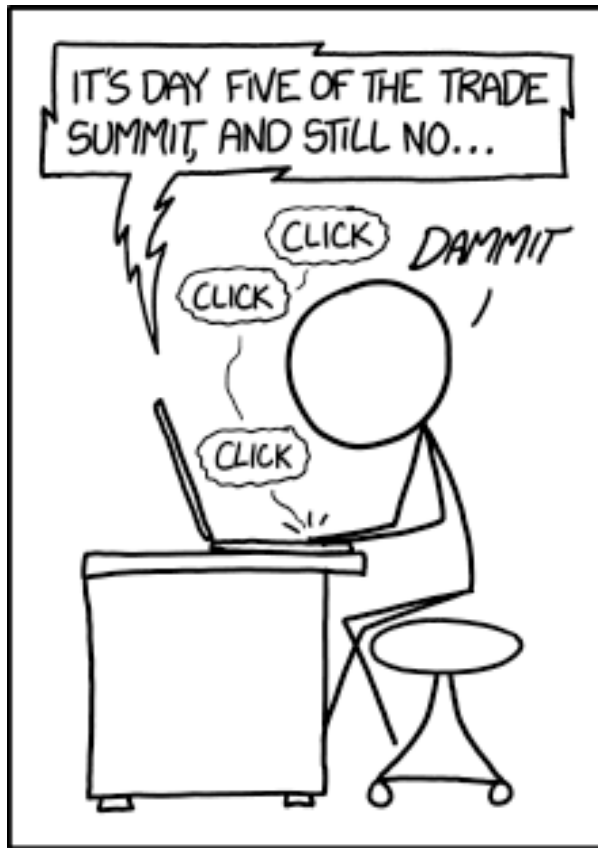
In the end, there is no practical solution to the problems arising from the uniqueness of usernames and email addresses. Instead, it is simply the consequence of naming itself: While a name was originally intended to

distinguish its bearer from a limited number of people (e.g. the rest of the village), the Internet makes it necessary to distinguish ourselves from the entire rest of the world (or at least everybody online).

Note that Gmail ignores everything behind a plus sign. Like ignoring dots, this is used as a way to create email aliases. The plus sign in the formula used in the comic should therefore be considered to be only an indicator for concatenation, not a literal character in the address.

#1280: Mystery News

October 21, 2013



I GET MOST OF MY NEWS
FROM AUTOPLAYING VIDEOS IN
BROWSER TABS I CAN'T FIND.

If you find and stop the video, but you've--against all odds--gotten curious about the trade summit, just leave the tab opened. It will mysteriously start playing again **30** minutes later!

Explanation

With the introduction of tabbed browsing, many users, even on widescreens, will have so many tabs open that it is hard to find any given one. At 44 tabs on Google Chrome on a 1080p screen, the user can no longer see any text on the tabs. Long before this point (~20 tabs), the text is so short as to be unusable. Randall refers to this tendency to open many tabs without closing them in this comic.

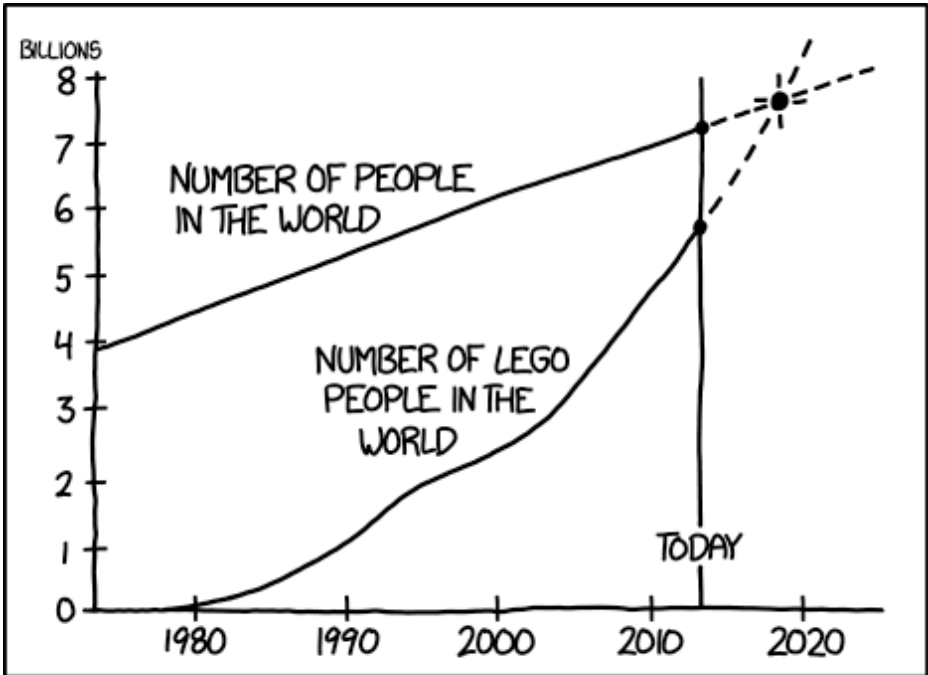
Many modern tabbed browsers can remember what tabs were open upon closure if this setting is on, and will reload the same tabs on startup. This will start any auto-playing videos, such as YouTube videos (although some browsers, like Firefox, have since fixed this by forcing videos to pause), which appear on any of the open pages. This situation can also occur during browsing when an auto-playing video does not begin playing until after a user has moved on to a new tab, when a page with a video refreshes in the background, or when a site with such a video automatically opens in a tab that does not become the active tab when it opens.

This generally leads the user to clicking through all of the open tabs to try to find where the sound is coming from. This can be even more difficult if the video is not obvious and not centered on the screen of whatever tab it is playing in. Years after the release of this comic, Google Chrome began to indicate to the user which tabs are playing audio, thus alleviating this problem.

The title text refers to websites that refresh in the background, causing videos (and ads) to start playing again even if you stopped them previously. Many news sites, such as CNN, will do this if you stay on the same page for 30 minutes.

#1281: Minifigs

October 23, 2013



BY 2019, HUMANS WILL BE OUTNUMBERED.

The LEGO Group is already the world's largest tire manufacturer.

Explanation

Lego minifigures (often abbreviated as minifigs) are tiny plastic people designed by the Danish toy manufacturer Lego as part of their construction toy sets. Since 1978, over four billion minifigures have been sold, so they still have a long way to go before they surpass the human population (which is around 8 billion). The figures resemble simplified humans, often with a yellow skin color and featuring interchangeable body parts, such as legs, torsos, heads, hair, and hats.

The graph depicted in the comic extrapolates the total number of minifigures and compares it to the growth of the world population, which reached 7 billion in March 2012. By the extrapolations of the comic, Lego minifigures will outnumber the human population by 2019. The extrapolation of statistical data has appeared in various xkcd comics, e.g. in 605: Extrapolating, 1007: Sustainable, and 1204: Detail. However, unlike the other extrapolated scenarios, the prognosis of this comic seems quite likely.

Since Lego is designed to resemble nature and civilization on a miniaturized scale, some sets also contain Lego cars as vehicles for the minifigures. With over 381 million Lego tires produced for these miniature cars, Lego is already the world's largest manufacturer of tires. This fact is addressed in the title text.

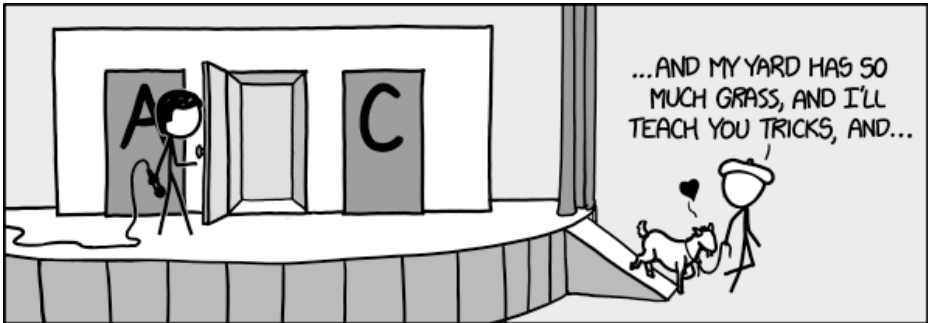
Lego (as of mid-October 2013) calculates they have made

7 billion+ figures. Earlier in 2013, they believed they would surpass the human count in 2014, but revised their numbers on the day this comic was released to what this chart says. (In 2019, there were 7.7 billion people and 7.9 billion minifigs, so this was true.)

Extrapolation and interpolation, often absurd, are recurrent topics on xkcd.

#1282: Monty Hall

October 25, 2013



A few minutes later, the goat from behind door C drives away in the car.

Explanation

This comic is a reference to the US game show *Let's Make a Deal*, a probability puzzle based on the show and named after its original host, Monty Hall. The premise of the show was that Hall would offer "deals" to contestants pulled from the audience in which they could win cash and prizes. Some deals involved games/tasks the contestant had to perform, while others simply involved the contestant making choices between a series of doors or boxes. In such games of choice, there were often several prizes and typically at least one "zonk", the show's name for an undesirable "gag" prize, which on the original Monty Hall version of the show were frequently animals such as goats.

The entire premise of a "zonk" is that the contestant would be disappointed. Goats were a common "zonk," and it's assumed most contestants would have no ability to house, and no use for, a domestic goat. The comic shows that Beret Guy, upon the host revealing that door B has a goat behind it, chooses to take the goat to keep as a pet, which makes them both very happy. This is much like, and may be an allusion to, the *Simpsons* episode *Bart Gets an Elephant*, in which Bart opts for the gag prize of an African Elephant rather than the \$10,000 award. According to an interview with Monty Hall, several contestants actually decided to keep the animals; although rare, it was allowed since the animals were offered as prizes (and they were a lot more expensive than the consolation cash prize).

The comic features Monty standing beside three doors, two visible reading "A" and "C" with the open door between them presumably labeled "B." This specifically is a reference to the Monty Hall problem, which was never featured on the show exactly as written but does otherwise match the aesthetics of the show. In the classic version of the Monty Hall Problem a contestant is offered a choice of three doors. Behind two of the doors are goats serving in their traditional "zonk" role, and behind one of them is a car as the (intended) correct prize. First, the contestant chooses a door, which remains closed. The host then opens one of the two remaining doors and reveals a goat. The contestant is then offered a final choice of whether to switch their choice to the remaining closed door, or keep the door they originally chose. The problem involves an analysis of the probability of the contestant choosing the car given certain circumstances. We have detailed more about the Monty Hall problem below.

The title text references the car and the other goat, untouched behind the remaining doors, and spoofs that the other goat will perform a car heist and drive away.

The Monty Hall Problem[edit]

The apparent "paradox" of the Monty Hall Problem is that many people's initial reaction once the host opens a door to reveal a goat, is that there are two remaining doors, one with a car and one with a goat; and therefore there is an equal probability the car is behind each door. Many people therefore believe that switching makes no difference to the odds of winning a car.

However, assuming that the host has knowledge of which doors contain goats, and that their choice of which door to open is always an unchosen door containing a goat, it is actually twice as likely that the contestant will win the car if they switch than if they keep their original choice. This is because the contestant initially had a one-in-three chance of choosing the car and a two-in-three chance of choosing a goat. Switching always wins the car in those two-thirds of cases where the contestant initially chose a goat. The probability of winning by switching is therefore the same as the probability that the contestant initially chose a goat.

The switch essentially gives the contestant both remaining doors instead of just the one door originally chosen. Because the host always has at least one goat available, the fact that the host reveals a goat does not provide the contestant any new information about their initially chosen door. The initial door still has a two-in-three chance of being a goat, and switching still has a two-in-three chance of winning. Opening a goat-door simply shifts all of the probability of the remaining two doors being a car to the remaining unchosen door.

Simple explanation:

Imagine there are 100 doors instead of just 2, and after you pick a door, the host opens all but one, revealing all goats. Do you switch to the remaining door or keep your initial pick? Just as there is a $2/3$ chance of picking the car when switching in the 3-door scenario, there is now a $99/100$ chance of picking the car when switching in the 100 door scenario. In this scenario, it becomes obvious that it is not a $50/50$ chance when two doors remain.

Important Side Note:

There has been great debate about the precise wording of the problem, and what assumptions or rules might apply. These variants can greatly change the probabilities.

One variant has the host open one of the two remaining doors at random, which could result in the car being revealed, and the game ending. In that scenario, if a goat has been revealed, the probability that the first pick is correct is now $1/2$ and switching is not advantageous.

With only $2/3$ ds of all possible games remaining, the chance that switching will win the car is now $(1/3)/(2/3) = 1/2$. Likewise, not switching also has a $1/2$ chance of winning. Note that this variant requires that the host picks a door at random.

Another variant has the host only offering to switch if the first choice is correct. In this case, switching always loses.

#1283: Headlines

October 28, 2013

20TH CENTURY HEADLINES REWRITTEN TO GET MORE CLICKS

HOW A SHOCKING NEW THEORY, DISCOVERED BY A DAD, PROVES SCIENTISTS ARE WRONG ABOUT <i>EVERYTHING!</i>	— 1905	
	1912	6 TITANIC SURVIVORS WHO SHOULD HAVE DIED
17 THINGS THAT WILL BE OUTLAWED NOW THAT WOMEN CAN VOTE	— 1920	
MOST EMBARRASSING REACTIONS TO THE STOCK MARKET CRASH [GIFS]	— 1928 — 1929	THIS ONE WEIRD MOLD KILLS ALL GERMS
5 INSANE PLANS FOR FEEDING WEST BERLIN YOU WON'T BELIEVE ARE REAL	— 1945 — 1948	THESE 9 NAZI ATROCITIES WILL MAKE YOU LOSE FAITH IN HUMANITY
12 NIP SLIPS POTENTIALLY VISIBLE TO SPUTNIK	— 1955 — 1957	AVOID POLIO WITH THIS ONE WEIRD TRICK
THIS IS THE MOST IMPORTANT PHOTO OF AN ASTRONAUT YOU'LL SEE ALL DAY	— 1968 — 1969	THIS YEAR'S ASSASSINATIONS RANKED FROM MOST TO LEAST TRAGIC
YOU WON'T BELIEVE WHAT THESE PEOPLE DID TO THE BERLIN WALL! [VIDEO]	— 1986 — 1989	THIS VIDEO OF A TERMINALLY ILL CHILD WATCHING THE <i>CHALLENGER</i> LAUNCH WILL BREAK YOUR HEART
	JAN 1, 1990	500 SIGNS YOU'RE A 90s KID

1916: 'PHYSICIST DAD' TURNS HIS ATTENTION TO GRAVITY,
AND YOU WON'T BELIEVE WHAT HE FINDS. [PICS] [NSFW]

Explanation

This comic satirizes the sensationalist language used in Internet headlines. Many websites generate ad revenue for getting visitors ("getting more clicks"), so some unscrupulous editors seek to manipulate their readers using tantalizing yet formulaic and crass headlines, designed to attract readers rather than summarize the article's contents. You might recognize this technique from those ridiculous text advertisements — "local mom discovers 1 weird tip to reduce belly fat." The practice is nothing new: tabloid journalism has been doing this for many years (e.g. National Enquirer). The numbers shown at the headline are also often wrong and not covered by the article.

Signs of a dishonest headline include giving undue weight to trivial topics, or appealing to readers' emotions or needs (fear, outrage, pity, lust, laziness) instead of offering serious information. In severe cases, it may be a bait-and-switch, claiming to offer something it isn't. By failing to give a useful summary of the story, whilst attempting to force the reader to click on every story on the off-chance that it's interesting, they amount to an intentionally deceptive form of spam.

Randall parodies the formula in this comic with such trivializing headlines for important historical events:

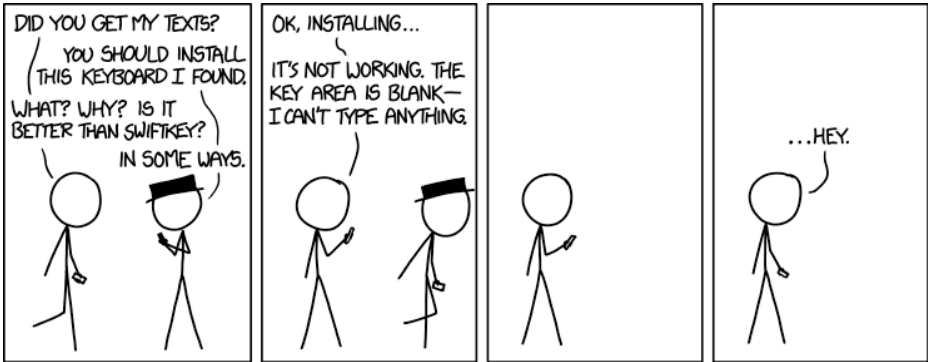
- 1905 - How a shocking new theory, discovered by a dad, proves scientists are wrong about everything!

- 1912 - 6 Titanic survivors who should have died
- 1920 - 17 things that will be outlawed now that women can vote
- 1928 - This one weird mold kills all germs
- 1929 - Most embarrassing reactions to the stock market crash [GIFS]
- 1945 - These 9 Nazi atrocities will make you lose faith in humanity
- 1948 - 5 insane plans for feeding West Berlin you won't believe are real
- 1955 - Avoid polio with this one weird trick
- 1957 - 12 nip slips potentially visible to Sputnik
- 1968 - This year's assassinations ranked from most to least tragic
- 1969 - This is the most important photo of an astronaut you'll see all day
- 1986 - This video of a terminally ill child watching the Challenger launch will break your heart
- 1989 - You won't believe what these people did to the Berlin wall! [video]
- Jan 1, 1990 - 500 signs you're a 90s kid
- Title text: 1916: 'Physicist dad' turns his attention to gravity, and you won't believe what he finds. [PICS] [NSFW]

This topic is re-used in 1307: BuzzFeed Christmas.

#1284: Improved Keyboard

October 30, 2013



I'm always installing tons of weird experimental keyboards because it serves as a good reminder that nothing I was going to type was really worth the trouble.

Explanation

Modern smartphones and tablets have touchscreen LCD displays which completely cover the device's surface; for this reason they rely on software keyboards to input text such as text messages. The simplest software keyboards simply display a standard QWERTY keyboard and allow the user to tap on the letters they wish to enter, but this is slow. More sophisticated software keyboards such as SwiftKey facilitate faster text entry through gestures supported by language models. Because this space is still under development, new software keyboards promising better text entry continue to appear.

Black Hat is annoyed about Cueball's text messages, so he sends Cueball a "better" keyboard that actually doesn't work — with the desired result that Cueball is not able to text him at all. His statement that the app is better than SwiftKey "in some ways" is literally true — it's better for him, not for Cueball.

The Android keyboard app SwiftKey has been mentioned before, and Black Hat has done something similar in 156: Commented.

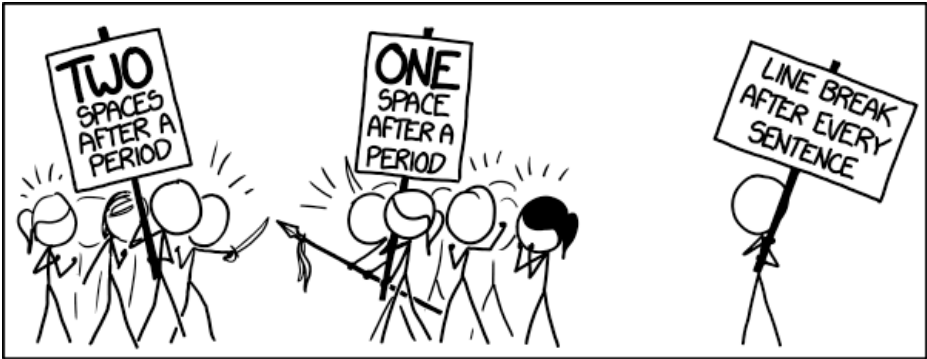
According to the title text, Randall does often try out new keyboard apps, only to be reminded each time that he ends up wasting more time learning the new gestures than he saves in typing more quickly. Alternatively, the increased effort and thought put into typing makes him realize that nothing he would type is really worth it to

him anymore.

Similar problems arise later in 1586: Keyboard Problems
and 1678: Recent Searches .

#1285: Third Way

November 01, 2013



'The monospaced-typewriter-font story is a **COMPLETE FABRICATION!** **WAKE UP, SHEEPLE!** 'It doesn't matter! Studies support single spaces!' 'Those results weren't statistically significant!' 'Fine, you win. I'm using double spaces right now!' 'Are not! We can all hear your stupid whitespace.'

Explanation

This comic refers to the debate occurring in the United States about the correct number of space characters after a period at the end of a sentence.

While typewriter typists in the United States were traditionally taught to use two spaces between sentences, this is becoming less common and many sources now recommend having only one space, although this topic is still controversial.

Cueball is advocating a line break after every sentence, the mysterious "third way".

This obviates the problem, as a period will always appear at the end of a line and the spacing after it becomes moot.

A line break after every sentence is sometimes called "semantic linefeeds".

This is particularly useful when plain text files based on a markup language (such as HTML, TeX, or Wiki markup) are edited by multiple people using a version control system where it helps to facilitate comparison of changes and avoid merge conflicts.

In most markup languages, a single line feed in the source is rendered as a simple space, while two linefeeds generate a paragraph break.

This approach allows the source to be easily manipulated

and versioned, while the rendered output still keeps the regular flow and justification abilities of running text.

(Incidentally, HTML and languages derived from it such as BBCode and Wiki markup will generally render multiple consecutive whitespace characters as a single space, so pretty much every page on the Internet uses single spacing whether the author wants to or not.)

The title text uses single spaces between the back-and-forth quotations; but within each quotation, the quoted speaker's preferred spacing is used; when the single-spacing advocate claims to be using double spacing, this is indeed a lie.

However, realistically, it is implausible that one can hear whitespace.[citation needed]

Randall's mocking characterization in the title text of overzealous advocates using the phrase "WAKE UP, SHEEPL" has appeared in previous comics: 496: Secretary: Part 3 and 1013: Wake Up Sheeple.

Note that this is not the first time Randall has proposed a controversial third way, and this debate is later referenced in 1989: IMHO.

Sentence spacing was previously mentioned in the title text of 1070: Words for Small Sets.

#1286: Encryptic

November 04, 2013

HACKERS RECENTLY LEAKED **153 MILLION** ADOBE USER EMAILS, ENCRYPTED PASSWORDS, AND PASSWORD HINTS.

ADOBE ENCRYPTED THE PASSWORDS IMPROPERLY, MISUSING BLOCK-MODE 3DES. THE RESULT IS SOMETHING WONDERFUL:

USER	PASSWORD	HINT	
4e18acc1ab2762d6		WEATHER VANE SWORD	<input type="text"/>
4e18acc1ab2762d6			<input type="text"/>
4e18acc1ab2762d6	a0a2876eb1ea1fca	NAME 1	<input type="text"/>
8babbb6279e06eb6d		DUH	
8babbb6279e06eb6d	a0a2876eb1ea1fca		<input type="text"/>
8babbb6279e06eb6d	85e9da81a2a78adc	57	
4e18acc1ab2762d6		FAVORITE OF 12 APOSTLES	
1ab29ac86da6e5ca	7a2d6a0a2876eb1e	WITH YOUR OWN HAND YOU HAVE DONE ALL THIS	
a1f9b2b6299e7e2b	ea0ec1e6ab797397	SEXY EARLOBES	<input type="text"/>
a1f9b2b6299e7e2b	617ab0277727ad85	BEST TOS EPISODE	<input type="text"/>
39738b7adb068af7	617ab0277727ad85	SUGARLAND	
1ab29ac86da6e5ca		NAME + JERSEY #	
877ab7889d3862b1		ALPHA	<input type="text"/>
877ab7889d3862b1			<input type="text"/>
877ab7889d3862b1			<input type="text"/>
877ab7889d3862b1		OBVIOUS	<input type="text"/>
877ab7889d3862b1		MICHAEL JACKSON	
38a7c9279c0deb44	9dca1d79d4dec6d5		
38a7c9279c0deb44	9dca1d79d4dec6d5	HE DID THE MASH, HE DID THE	<input type="text"/>
38a7c9279c0deb44		PURLOINED	<input type="text"/>
a8ae57d5c7b7af7a	9dca1d79d4dec6d5	FAV. LATER-3 POKEMON	

THE GREATEST CROSSWORD PUZZLE
IN THE HISTORY OF THE WORLD

It was bound to happen eventually. This data theft will enable almost limitless [xkcd.com/792]-style password reuse attacks in the coming weeks. There's only one group that comes out of this looking smart: Everyone who

pirated Photoshop.

Explanation

Web sites and other computers that authenticate users via passwords need to be able to know if the user typed in the right password. But storing the password itself on the computer has been known to be unnecessarily risky since the publication of Password Security: A Case History in 1978. In that paper, Robert Morris and Ken Thompson demonstrated the practice of using a slow, cryptographically-secure one-way hash function, so that even if the password file is stolen, it will be very hard to figure out what the passwords are, so long as the passwords themselves are suitably complex. They also pioneered the use of a "salt" which makes each password hash completely different even if two users use the same password. See A tour of password questions and answers for background on salts and suitably slow hash functions.

Adobe, however, ignored these well-known principles, and instead stored over a hundred million passwords in a reversibly encrypted way, using a terrible choice of encryption methods which exposes a great deal of information about the passwords, and does not involve a salt. This password database was recently obtained by someone and released on the Internet.

In particular, Adobe used Triple DES, an older encryption algorithm which can still be relatively secure when properly used, but they used it improperly. It works on 64-bit (8 character) blocks. Assuming that the

passwords are stored in plain ASCII, this means that a sequence of 8 characters in a password which starts on a character position which is a multiple of eight is always encrypted to the same result. Therefore, two passwords starting with "12345678" would start with the same block after being encrypted. Furthermore, this means that you can actually get a very good idea of the length of the password since anything with only one block is a password with length between 1 and 8 characters, and having two blocks implies it has between 9 and 16 characters, etc.

Adobe also stored hints users created for their passwords. That means that an attacker knows not only if the same 8 characters are used for multiple passwords but also has some hints for guessing them. That means that common password portions should be easy to recover and that any user may be "compromised" by someone else using a part of the same password and providing a good hint. As an example, a password having three hints "Big Apple", "Twin Towers" and "If you can make it there" is probably "New York" or a simple variation on that. The weakness here is that no decryption and therefore no hard cracking has to take place, you just group the passwords by their encrypted blocks and try to solve them like a crossword puzzle. These weaknesses have already been used to presumably identify a password used by Edward Snowden, as discussed at 7 Habits of Highly Effective Hackers: Can someone be targeted using the Adobe breach?.

The examples are not taken from the actual leaked file,

since that uses a different format, and the examples are evidently cleverly crafted to make a nice crossword-like puzzle, which can be solved as shown in the Passwords section below.

As mentioned on <http://filosottile.github.io/analyzing-the-adobe-leaked-passwords/> the data in the comic isn't real and contains a hidden message. If the "user password" hashes are Base64 encoded, they read:

More readable:

E.g., with the initial unique hash blocks: `python2 -c "print '4e18acc1ab27a2d6a0a2876eb1ea1fca'.decode('hex_code c').encode('base64')"`

The last letter "r" is not fully encoded in the data shown, but any letter from "g" to "v" produces the same binary data.

Title Text[edit]

The title text makes a reference to a previous comic: Black Hat's trouble with what to do with stolen passwords. It also states that users of pirated Photoshop are the winners here. This is because in order to make Photoshop pirate-able, it was modified (cracked) by removing the requirement for registration so their passwords were not sent to Adobe and therefore are not present in the leaked file.

Soon after this comic was published, the most common 1000 passwords were actually compiled into a set of 10 interactive

online crosswords, inspired by the comic.

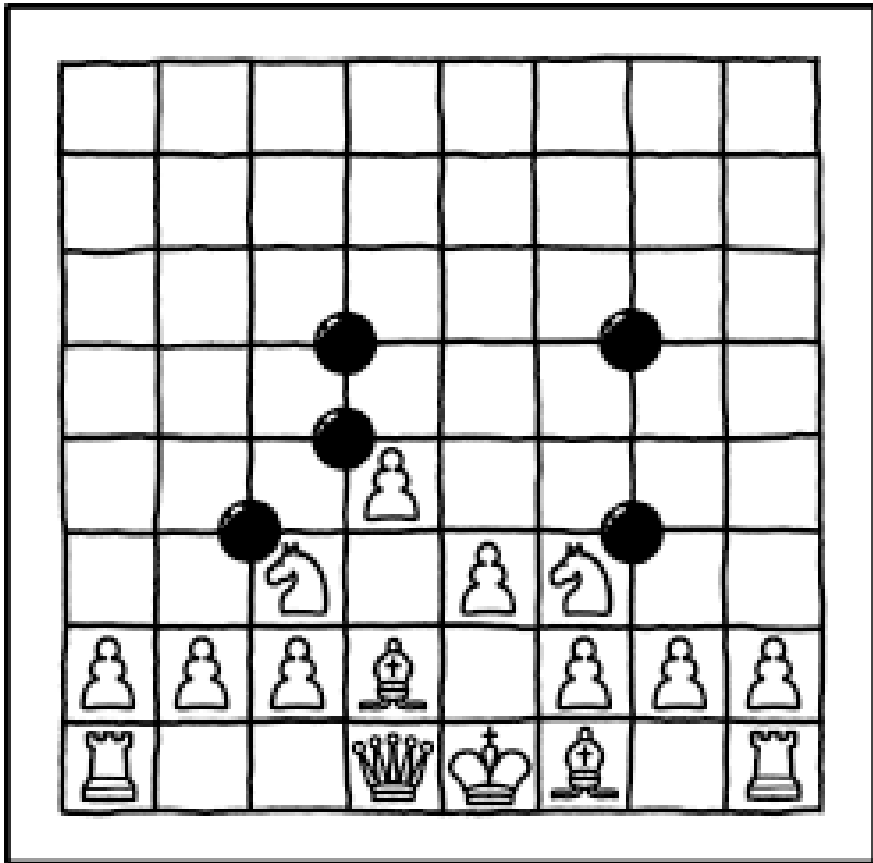
The title itself is a reference to cryptic crosswords. (see 2032: Word Puzzles)

Passwords[edit]

Note that characters in the passwords could be upper or lower case, and they may involve common substitutions like "0" (number zero) for "O" (letter O); therefore, the clues cannot guarantee that the answer shown here is precisely correct. Nevertheless, we have plenty of information for a brute force attack.

#1287: Puzzle

November 06, 2013



WHITE TO CONTINUE INSISTING
THIS IS A CHESSBOARD

Prediction for Carlsen v. Anand: ... 25. Qb8+ Nxb8 26. Rd8# f6 27. "... dude." Qf5 28. "The game is over, dude." Qxg5 29. Rxe8 O-I 30. "Dude, your move can't be 'O-I'. Don't write that down." [Black flips board]

Explanation

The game of Go (also called Weiqi, Baduk or Igo) is usually played on the 19×19 intersections of a grid, but sometimes a faster, simpler version is played on the 9×9 intersections of a grid; which thus has 8×8 squares, as a chessboard, though they are not colored in an alternating pattern – introduced to chess in the 13th century. In the comic, White has chess pieces and plays against Black, who uses Go stones.

In chess, particularly in puzzles, the phrasing "White to move" indicates that it's the White player's turn; "White to play and win" indicates that it's White's turn and if White plays correctly, the next series of moves will result in an advantageous position or possibly outright win for White. The caption "White to continue insisting this is a chessboard" is a play on this traditional phrasing. The same kind of phrasing is also used in Go puzzles. In Go puzzles the objectives are often of a local or tactical character, such as "White to capture four black stones" or "White to live in the corner".

The comic originally displayed three white bishops at positions c1 (to the left of the queen), f1 (to the right of the king), and e4 (three squares in front of the king). The same day the comic was posted, it was updated to have only two white bishops, replacing the ones at c1 and e4 with a single bishop in d2 (one space in front of the queen). On both boards, White has none of their pieces captured (likely because Black isn't playing chess), and

therefore having three bishops would be impossible without having seven or fewer pawns.

It is unclear who has gone first. In Go it is traditional for Black to go first, while in chess it has been traditional for White to go first for about a century. Indeed, both players have made five moves, although the caption/"punchline" implies it is the start of White's sixth turn; though if Black did go first, none of their pieces are in the 3-3 handicap positions marked on a 9×9 Go board.

The title text refers to the then-upcoming 2013 World Chess Championship between Carlsen and Anand. Magnus Carlsen is (at publishing of this comic) a 23 year old Norwegian chess grandmaster. Viswanathan Anand is (at publishing time) a 44 year old Indian grandmaster. Both have been (and as of 2019 are) among the world top chess players.

The game transcript in the title text refers to the ending of the famous Opera Game between Paul Morphy and the Duke of Brunswick and Count Isouard. That game ends with 16. Qb8+ Nxb8 17. Rd8#. In the title text, Black continues to make moves as if he has not been checkmated, over White's protests. After White uses his rook to capture Black's king to emphasize the checkmate, Black defiantly writes "0-1" (the notation symbolizing a Black victory) on his scoresheet. When informed that his move cannot be to declare victory, he flips the board. "0-1" may also represent a position on a Go board (first down on the top left corner) in certain coordinates systems.

The game transcript is written in standard algebraic notation. The destination square is represented by a lowercase letter (a-h, on the x-axis) and a number (1-8, on the y-axis), with the bottom-left square from White's perspective being a1 and the top-right square being h8. The uppercase letters refer to the piece that is moving to that square (e.g., Q = queen, K = king, N = knight, R = rook), so Qa1 would mean moving the queen to White's bottom-left square. The absence of an uppercase letter refers to a pawn's move (e.g., "f6" means moving a pawn to f6). If the move captures a piece, an "x" is inserted between the piece and the destination (e.g., Nxb8). Checks are indicated by +, and checkmate by #.

#1288: Substitutions

November 08, 2013

SUBSTITUTIONS

THAT MAKE READING THE NEWS MORE FUN:

WITNESSES	→	THESE DUDES I KNOW
ALLEGEDLY	→	KINDA PROBABLY
NEW STUDY	→	TUMBLR POST
REBUILD	→	AVENGE
SPACE	→	SPAAACE
GOOGLE GLASS	→	VIRTUAL BOY
SMARTPHONE	→	POKÉDEX
ELECTRIC	→	ATOMIC
SENATOR	→	ELF-LORD
CAR	→	CAT
ELECTION	→	EATING CONTEST
CONGRESSIONAL LEADERS	→	RIVER SPIRITS
HOMELAND SECURITY	→	HOMESTAR RUNNER
COULD NOT BE REACHED FOR COMMENT	→	IS GUILTY AND EVERYONE KNOWS IT

INSIDE ELON MUSK'S NEW ATOMIC CAT

Explanation

This is the first comic in the Substitution series where Randall has suggested substitutions that will make reading the news more fun. But there have been several comics using substitutions both before and after these ones.

This is the entire Substitutions series:

- 1288: Substitutions
- 1625: Substitutions 2
- 1679: Substitutions 3

Randall is playing off of the fact that many readers of modern news articles quickly become bored with the legal and political jargon. He suggests that substituting certain words for others can make reading the article more interesting, albeit less accurate. Although since Randall doesn't think very highly of the news, he's probably suggesting this chart wouldn't make them less accurate at all. (See for instance 558: 1000 'Times and 932: CIA.). For example, a sentence that reads:

would be changed to

This substitution does not change the meaning much, and the original sentence does not lose much of its accuracy. However, for substitutions later in the comic, a sentence may be changed as follows:

into

Which is less meaningful, but more interesting. The final substitution returns from the realm of the ridiculous to replacing "could not be reached for comment" with "is guilty and everyone knows it." If a journalist writes a story about an accused suspect but is unable to contact them or receives no response from them, they will write that the person "could not be reached for comment." Randall's whimsical assumption that silence implies guilt is so common that juries are instructed that they should not infer guilt if the defendant fails to testify, particularly in nations that have a right against self-incrimination. 'Spaaace' could be a reference to the Space Core from Portal 2, or to the way The Muppet Show presented Pigs in Spaaace.

The Virtual Boy is a table-top video game console made by Nintendo released in 1995 and discontinued about the same year. It achieved true-3D graphics through the use of a large visor containing a pair of LED screens, though it considered having done so incredibly poorly, while also lacking any form of ergonomic comfort and sporting several critical design flaws. As a result, it is commonly mocked as one of Nintendo's biggest failures (sometimes by Nintendo itself). The Pokédex is a device in the Pokémon world that records the data of captured Pokémon. Homestar Runner is the title character of a Flash-animated web cartoon series, known for being an idiot.

It seems generally that Randall is no fan of Google Glass,

which was also shown earlier in 1251: Anti-Glass and later in 1304: Glass Trolling. Thus, explaining why Google Glass has such a ridiculous substitution as Virtual Boy. Google Glass has become a recurring theme in xkcd. In the title text, Elon Musk is mentioned. He is (amongst other things) the CEO of Tesla Motors, which produces electric cars. In the title text "atomic cats" replaced the sentence "Electric cars" according to the chart of the comic. News reports about new studies (Tumblr posts) are further lampooned in 1295: New Study, a comic posted two weeks later.

#1289: Simple Answers

November 11, 2013

THE SIMPLE ANSWERS TO THE QUESTIONS THAT GET ASKED ABOUT EVERY NEW TECHNOLOGY:

WILL <input type="checkbox"/> MAKE US ALL GENIUSES?	NO
WILL <input type="checkbox"/> MAKE US ALL MORONS?	NO
WILL <input type="checkbox"/> DESTROY WHOLE INDUSTRIES?	YES
WILL <input type="checkbox"/> MAKE US MORE EMPATHETIC?	NO
WILL <input type="checkbox"/> MAKE US LESS CARING?	NO
WILL TEENS USE <input type="checkbox"/> FOR SEX?	YES
WERE THEY GOING TO HAVE SEX ANYWAY?	YES
WILL <input type="checkbox"/> DESTROY MUSIC?	NO
WILL <input type="checkbox"/> DESTROY ART?	NO
BUT CAN'T WE GO BACK TO A TIME WHEN—	NO
WILL <input type="checkbox"/> BRING ABOUT WORLD PEACE?	NO
WILL <input type="checkbox"/> CAUSE WIDESPREAD ALIENATION BY CREATING A WORLD OF EMPTY EXPERIENCES?	WE WERE ALREADY ALIENATED

'Will [] allow us to better understand each other and thus make war undesirable?' is one that pops up whenever we invent a new communication medium.

Explanation

This is Randall's commentary on some of the baseless skepticism and equally baseless optimism directed at new technologies. Related: 1215: Insight and 1227: The Pace of Modern Life. While it's always healthy to evaluate the advantages and disadvantages of cutting-edge tech before blindly diving in and adopting it, it's not healthy to base that evaluation on unrealistically high standards and expectations.

Randall provides a set of predictions that tend to be made about new major technologies (particularly communications and multimedia technologies), and answers the question of whether those predictions are likely to actually come true. Importantly, these predictions have been made for many years, about many different technologies (reaching back at least as far as radio, and some as far back as the printing press), so Randall is likely confident in his answers, based on past performance.

Will [] make us all geniuses/morons? No. While it is possible for new technologies to make education and information more widely available, it's never going to make everyone a genius. At the same time, while new technologies might introduce new distractions or avenues for misinformation, they're unlikely to genuinely make people less intelligent en masse.

Will [] destroy whole industries? Yes. Most significant

technologies, once widely adopted, with tend to either make other technologies obsolete, or eliminate the need or desire for other products or services. Accordingly, there's a long history of industries rising and falling as new technologies develop, and there's little reason to imagine this changing. This is a bit of a loaded question because "destroy industries" sounds negative, and only covers half the effect — instead of merely destroying them, we're also replacing them with something (hopefully) better.

Will teens use [] for sex? Yes. Were they going to have sex anyway? Yes. The first question is usually raised in a way that's either salacious or fear-mongering, but the second puts it into context. Most teens have sex at some point, and many have active sex lives, which has been true pretty much throughout history. This is upsetting to many adults, but is more or less unavoidable. When new technologies become commonplace, it's almost inevitable that it will become involved in sex somehow. This can be presented as the technology encourages sexual immorality, but there's little reason to believe that new technologies makes it more likely that young people will have sex.

Will [] destroy music/art? No. Every new technology for reproducing musical and artistic works (such as player pianos and video cassette recorders) has been accompanied by warnings that it will destroy the industry that supplies it content. While it is likely that industries built around art will be disrupted (see above), the nature of music and art are so fundamental to human

beings that it's certain they'll survive, even if the business models around them change.

But can't we go back to a time when— No. Elderly people frequently express their disapproval of modern culture and lifestyle, and of the technology that drives them. These judgments may reflect valid concerns about damaging trends, or they may merely reflect nostalgia and a bias against a world they no longer understand. In either case, it's implausible that society will simply decide to reverse technological or cultural trends. For better or worse, they're here to stay.

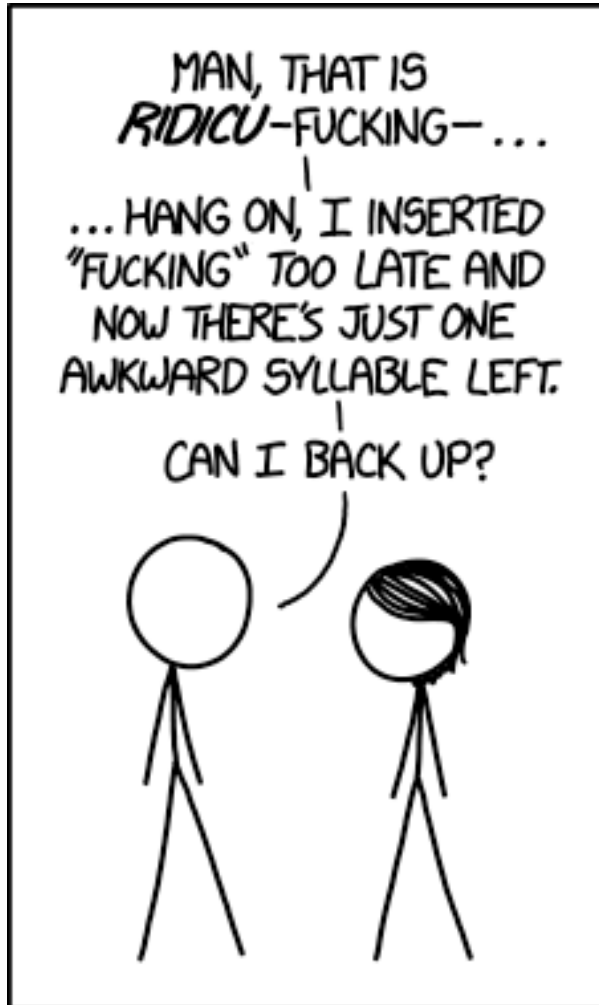
Will [] bring about world peace?- No. People have been trying to bring about world peace for centuries; While it is possible for diplomatic and cultural advances to make war less widespread and/or less destructive, conflict between nations and peoples seems unlikely to end anytime soon, and it's entirely implausible that any given piece of technology will bring about that end.

The final answer is a depressing and strangely beautiful comment on human nature: Will [] cause widespread alienation by creating a world of empty experiences? We were already alienated. Skeptics may be concerned that a new technology will make people's pleasures and interactions more artificial and shallow; Randall comments that this is already something well known in our society, seemingly dismissing the possibility that new technologies will make this any worse. This would later be touched on again in 1601: Isolation.

The title text asks, Will [] allow us to better understand each other and thus make war undesirable?, and suggests that it comes up every time a new communication medium is invented. The argument has long been that wars require us to effectively dehumanize one another (which is the only way that mass slaughter can be justified), so the ability to communicate more freely with people from other nations will make it impossible for us to consider war as an option. Unfortunately, the ability to mentally separate ourselves from one another appears to be quite resilient, particularly when there's strong incentive to so do (which is often the case in international conflicts). What's more, the same communications technology that can help us interact across borders can also be used by belligerent voices to dehumanize others and justify the use of force. While war is always "undesirable", in the sense that it has huge human and financial costs, people keep managing to make it happen, and technology doesn't seem capable of changing that.

#1290: Syllable Planning

November 13, 2013



You absolute-fucking-... shit.

Explanation

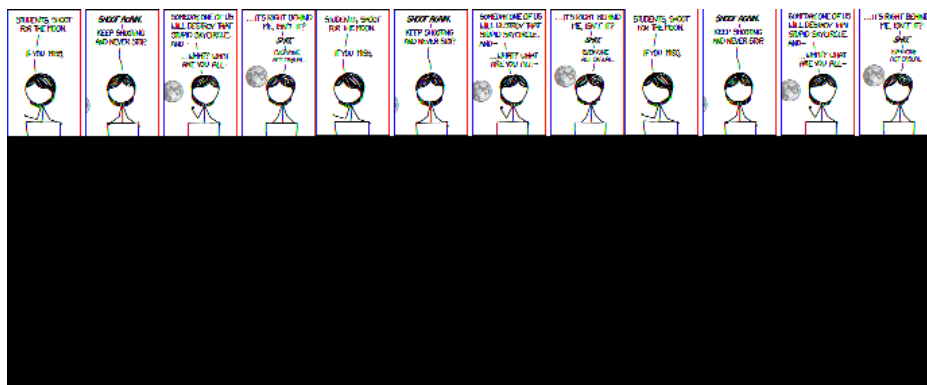
Cueball wants to say ri-fucking-diculous, but he inserts the fucking too late in the word. Now, he has to say ridicu-fucking-lous, which sounds, well, ridicu-fucking... wait.

This is an example of tmesis, the breaking up of a word to include another within it, and more specifically of expletive infixation. Normally, for rhythmic reasons the included word is inserted before the stressed syllable (ridiculous becoming ri-fucking-diculous) which is what Cueball messed up. However, in some cases it is also possible to break the word after a prefix instead, so for some words there are two ways to do it e.g. unbe-fucking-lievable (before the stressed syllable) or un-fucking-believable; this is because unbelievable is a combination of un and believable to negate believable which is an actual English word[citation needed] and therefore it still sounds good.

The title text introduces a further example, with speaker inserting the fucking too late into the word absolutely—which would have resulted in absolute-fucking-ly—but leaving the word unfinished when they realize their mistake. The more usual tmesis here would be abso-fucking-lutely. Furthermore, the speaker could be also accidentally insulting the person they're speaking to, calling them an "absolute fucking shit."

#1291: Shoot for the Moon

November 15, 2013



Shoot for the Moon. If you miss, you'll end up co-orbiting the Sun alongside Earth, living out your days alone in the void within sight of the lush, welcoming home you left behind.

Explanation

The comic and the title text both parody the motivational quote attributed to Leslie Brown, which originally says, "Shoot for the Moon. Even if you miss, you'll land among the stars."

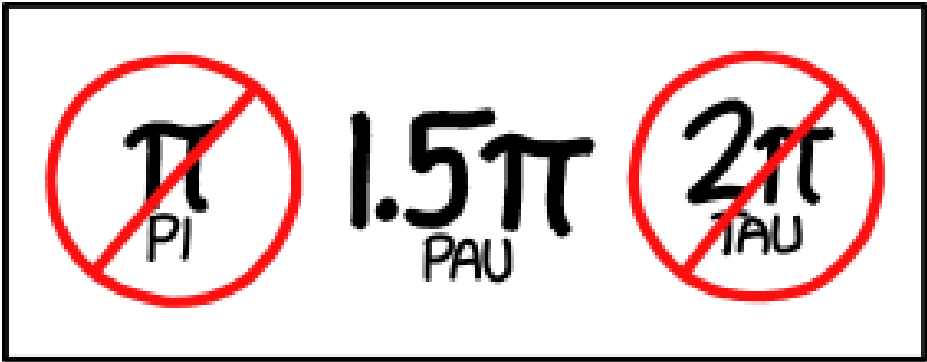
In the original form, the phrase "Shoot for the moon" is figurative, meant to inspire people to pursue ambitious goals, reasoning that even if they fail to achieve them, they may still accomplish other great things while trying. The comic and title text, on the other hand, is literally referring to the moon, and using the word "shoot" not in the sense of "aspire" but to mean "fire a weapon at." The comic further explores the humorous motivations for "shooting the moon"; Megan wants to destroy and kill the moon in order to humble it, feeling taunted by its orbiting merrily over her head, and so she inspires her students to physically attempt to destroy the moon whenever possible, only to become sheepish when she realizes the moon is right behind her, as if it were a person who could become offended by what she is saying. This is, of course, a common comedy trope.

The title text invokes another literal interpretation of the phrase - if a space vehicle aims at the Moon and misses, it will end up in a new orbit, possibly (depending on its velocity) escaping from the Earth-Moon system and following a separate but nearby orbit around the Sun. A solar orbit is very hard, very fuel-intensive, and very lengthy to return from, despite physically meaning you

will remain very close to Earth, even close enough to see it with some optical magnification. Thus, as a hypothetical space explorer's life support gradually ran out because his craft could not make it back to Earth in time, he would be taunted by Earth remaining close to him. Getting stranded on the Moon was the subject of the title text of 1510: Napoleon and of 1484: Apollo Speeches.

#1292: Pi vs. Tau

November 18, 2013



A COMPROMISE SOLUTION TO THE PI/TAU DISPUTE

Conveniently approximated as $e+2$, Pau is commonly known as the Devil's Ratio (because in the octal expansion, '666' appears four times in the first 200 digits while no other run of 3+ digits appears more than once.)

Explanation

This is yet another of Randall's compromise comics. A few mathematicians argue as to whether to use pi, which is the ratio between a circle's circumference and its diameter, or tau, which is the ratio between a circle's circumference and its radius.

Some consider pi to be the wrong convention and are in favor of using tau as the circle constant; see the Tau Manifesto, which was inspired by the article "Pi is wrong!" by mathematician Robert Palais and publicized by Vi Hart (video was made private). Others consider proponents of tau to be foolish and remain loyal to pi (see the Pi Manifesto). Of course, regardless of which convention is used, the change is merely in notation — the underlying mathematics remains unaltered. Still, the choice of pi vs. tau can affect the clarity of equations, analogies between different equations, and how easy various subjects are to teach.

Most people know π (pi) by the approximation 3.14, but do not know τ (tau) which, by definition, is twice as large as pi. Randall is suggesting using "pau", which is a portmanteau of "pi" and "tau", as a number situated, appropriately enough, halfway between pi and tau, i.e. 1.5 pi or 0.75 tau. But of course his number would be inconvenient, as this value does not naturally turn up when working with circles or other mathematical constructs, so there are no commonly used formulas that would use pau.

The title text claims that π can be approximated by $e+2$, as both values are roughly 4.71 — a similarity that holds little since it requires another irrational constant, e (although knowing the value of π is somewhat more helpful in remembering e to 2 digits.)[citation needed] It also attributes the nickname "Devil's Ratio" to π , due to the sequence 666 supposedly appearing four times in the first 200 digits of π when expressed in the octal base. However, this is not the case, and was likely due to an error in the computer system used by WolframAlpha; for more details see below.

The tau vs. pi controversy was later mentioned in 2520: Symbols.

#1293: Job Interview

November 20, 2013



Explanation

Following on from his attempts at networking, Beret Guy, the oddball of the xkcd cast, conducts an interview for a position at his mysterious company.

Much like most of Beret Guy's interactions with people, Beret Guy is cheerful and upbeat, yet indicates that he has at best a scrambled understanding of how people in this situation normally act. Because of this, the job interview becomes increasingly bizarre, starting with Beret Guy's assertion that the company headquarters is a "real building [he] found", implying that the building's reality might be in question. In addition, "finding" the building may imply that he does not own or rent it, but simply found it empty and moved in. He says his company makes "stuff for phones", but then adds, "like apps and stickers," two wildly different products in terms of both production and profitability.[citation needed] He is strangely vague about both the position ("someone to write on our computers") and the salary ("a bunch of paychecks"). Then he mentions ghosts, which is either a powerful disincentive from joining the company, yet another sign that Beret Guy is mentally unsound, or both.

The strip finishes with Beret Guy plugging a cord into what appears to be an electrical outlet clumsily labeled "Soup," which then, implausibly, actually starts dispensing soup. Most electrical outlets do not function like this.[citation needed] However, this is a typical

behaviour of Beret Guy - see a similar example in: 1395: Power Cord. It is possible that the electrical outlet is connected to a pipe which supplies soup from a soup reservoir or kitchen elsewhere in the facility, which would require the fixture to have a specialist valve-connector and the 'cable' to involve a pipe with a self-sealing end that 'keys' the valve open. It may even be more likely, given Beret Guy's 'abilities', that the outlet is taking electricity from a suitable power supply and the cord ultimately uses mass-energy conversion to turn it into soup; this would be in line with the possible operating mechanism of Beret Guy's water-creating dam in 2710: Hydropower Breakthrough.

The title text may be a reference to the biblical story of Job (pronounced with a long O to rhyme with globe), who was put through many horrendous ordeals to test his faith in God. This suggests that the interviewee will be taking on not a "job experience" but rather a "Job experience" (i.e. the job will be a horrendous ordeal).

#1294: Telescope Names

November 22, 2013

THE VERY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE VERY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE VERY LARGE TELESCOPE	<input checked="" type="checkbox"/>
THE EXTREMELY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE EXTREMELY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE EXTREMELY LARGE TELESCOPE	<input checked="" type="checkbox"/>
THE OVERABUNDANTLY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE OVERABUNDANTLY LARGE TELESCOPE	<input checked="" type="checkbox"/>	THE OVERABUNDANTLY LARGE TELESCOPE	<input checked="" type="checkbox"/>
THE OPPRESSIVELY COLOSSAL TELESCOPE	<input type="checkbox"/>	THE OPPRESSIVELY COLOSSAL TELESCOPE	<input type="checkbox"/>	THE OPPRESSIVELY COLOSSAL TELESCOPE	<input type="checkbox"/>
THE MIND-BOMBINGLY VAST TELESCOPE	<input type="checkbox"/>	THE MIND-BOMBINGLY VAST TELESCOPE	<input type="checkbox"/>	THE MIND-BOMBINGLY VAST TELESCOPE	<input type="checkbox"/>
THE DESPAIR TELESCOPE	<input type="checkbox"/>	THE DYNAMIC TELESCOPE	<input type="checkbox"/>	THE DESPAIR TELESCOPE	<input type="checkbox"/>
THE DYNAMIC TELESCOPE	<input type="checkbox"/>	THE DYNAMIC TELESCOPE	<input type="checkbox"/>	THE DYNAMIC TELESCOPE	<input type="checkbox"/>
THE TELESCOPE OF DEGENERATION	<input type="checkbox"/>	THE TELESCOPE OF DEGENERATION	<input type="checkbox"/>	THE TELESCOPE OF DEGENERATION	<input type="checkbox"/>
THE NIGHTMARE SCOPE	<input type="checkbox"/>	THE NIGHTMARE SCOPE	<input type="checkbox"/>	THE NIGHTMARE SCOPE	<input type="checkbox"/>
THE INFINITE TELESCOPE	<input type="checkbox"/>	THE INFINITE TELESCOPE	<input type="checkbox"/>	THE INFINITE TELESCOPE	<input type="checkbox"/>
THE FINAL TELESCOPE	<input type="checkbox"/>	THE FINAL TELESCOPE	<input type="checkbox"/>	THE FINAL TELESCOPE	<input type="checkbox"/>

The Thirty Meter Telescope will be renamed The
Flesh-Searing Eye on the Volcano.

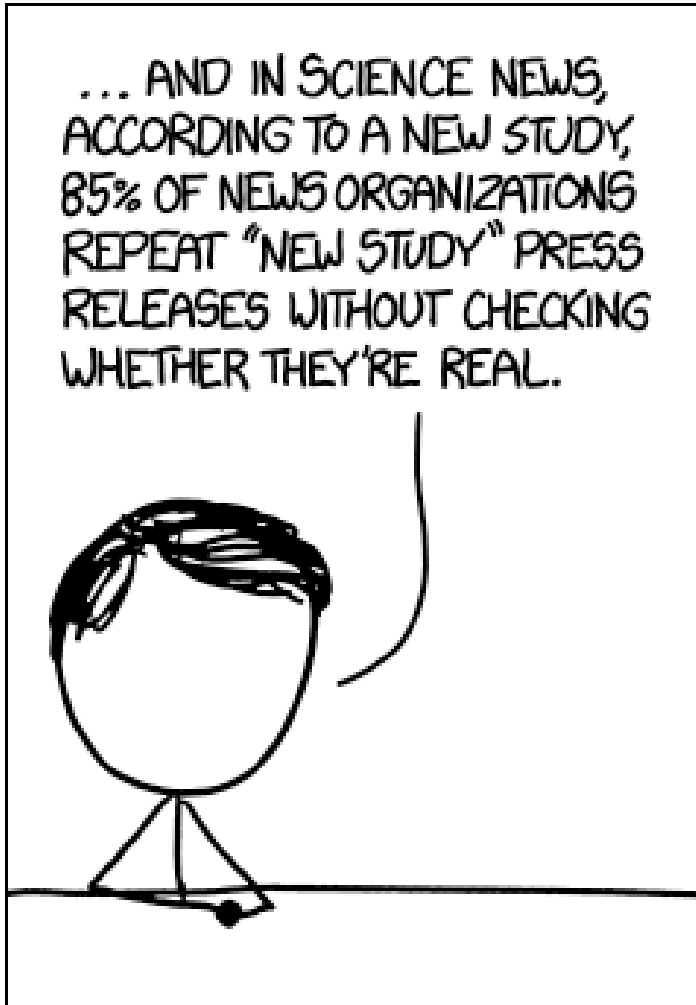
Explanation

The Very Large Telescope is an existing telescope, while the (European) Extremely Large Telescope was in an advanced planning stage at the time of the comic's release. The Overwhelmingly Large Telescope was another proposed telescope that, as the comic mentions, was cancelled. The comic pokes fun at the generic nature of the names of the telescopes by proposing more generic but increasingly ridiculous names for future telescopes.

The title text talks about the Thirty Meter Telescope, which is about to begin construction on Mauna Kea (a dormant volcano) in Hawaii, and seems to compare it to the Eye of Sauron. It is expected to be the most advanced and powerful optical telescope on Earth when completed.

#1295: New Study

November 25, 2013



When the results are published, no one will be sure whether to report on them again.

Explanation

Hairy as a news anchor is reporting on a new study. This is another of Randall's jabs at modern news networks. The joke is twofold: 1. news organizations often repeat press releases on scientific studies without fact checking; 2. the study being reported by the news organization in the comic is presumably itself invented and would not stand up to fact checking.

Some examples of how true this can be:

- A July 2011 hoax study correlated Intelligence Quotient (IQ) and Browser Usage, specifically asserting that Microsoft Internet Explorer users had a significantly lower I.Q. than other users. The study was reported by over 30 news outlets including NPR, Forbes, CBS News, San Francisco Chronicle, The Inquirer, and CNN. The perpetrator made little effort to conceal the deception by publishing it on a freshly created domain name with a parking lot as the corporate address, and was surprised that so many reputable outlets did no fact checking.
- Samsung pays \$1bn USD fine to Apple with 20 billion 5 cent coins: a spoof article that was widely re-reported on news networks in November 2013 despite being demonstrably impossible (there are barely that many nickels in circulation, for a start).
- Even many low-tier scientific journals don't do proper checking. Over a hundred of them accepted a fake,

error-ridden cancer study for publication in a spoof organized by Science magazine, as reported by National Geographic: Fake Cancer Study Spotlights Bogus Science Journals.

The title text implies there is an actual study being performed to determine what percentage of news organizations repeat "new study" press releases without checking whether they're real, and that the fake study being reported on by the (unknowing) reporter in the comic is part of the experiment being performed to find that true percentage. When this study concludes, the reporters will not know whether to report on its findings, either because they've already reported on a similar (but fake) story, or because they no longer trust stories of that nature.

Related jokes:

- "87% of statistics are made up on the spot" (which is itself completely fictitious). This joke has most famously been referenced by the May 8, 2008 Dilbert comic strip. It was also (with a more precise figure of 88.2%) the punchline of a television advertisement for Guinness in 1997, where it was attributed to the comedian Vic Reeves. ()
- "64 percent of all the world's statistics are made up right there on the spot, 82.4 percent of people believe 'em whether they're accurate statistics or not" - Statistician's Blues, by Todd Snider (lyrics; video).
- 83% is the made-up statistics number that How I Met

Your Mother character Barney Stinson uses to charm ladies.

Side note: People making the substitutions in 1288: Substitutions, a comic posted two weeks before this one, will read this comic as one about Tumblr posts.

#1296: Git Commit

November 27, 2013

	COMMENT	DATE
○	CREATED MAIN LOOP & TIMING CONTROL	14 HOURS AGO
○	ENABLED CONFIG FILE PARSING	9 HOURS AGO
○	MISC BUGFIXES	5 HOURS AGO
○	CODE ADDITIONS/EDITS	4 HOURS AGO
○	MORE CODE	4 HOURS AGO
○	HERE HAVE CODE	4 HOURS AGO
○	AAAAA	3 HOURS AGO
○	ADKFJSLKDFJSDKLFJ	3 HOURS AGO
○	MY HANDS ARE TYPING WORDS	2 HOURS AGO
○	HAAAAAAAAANDS	2 HOURS AGO

AS A PROJECT DRAGS ON, MY GIT COMMIT
MESSAGES GET LESS AND LESS INFORMATIVE.

Merge branch 'asdfasjkfdlas/alkdjf' into sdkjfls-final

Explanation

This comic refers to the Git source code revision control software, which saves earlier versions of files and folders for later access into a special repository. This comes in handy when you want to try out whether an idea works (branching). Further, you can collaborate with others by use of remote repositories. Perhaps most importantly, it allows members of the development team to find key changes in the history, later. Git has been discussed in 1597: Git as well.

A commit is a saved version in a Git repository; a commit comes with a message that is supposed to describe what the commit contains, similar to the edit summaries used on MediaWiki sites such as explain xkcd and on this explanation. Randall, however, finds himself losing interest in the commit messages the more code he writes and winds up just using placeholder text or jokes to himself. Presumably, this is because his separate commits are part of a large effort that can't be effectively summarized, and where there's no particular urgent need to differentiate the commits. Seeing as in this context 12 hours of coding can be considered "dragging on," it's safe to assume that the kinds of commits Randall is talking about are not for some major in-production project, nor for something that a lot of other people are working on. In both of those cases, one would be much more likely to use descriptive commit messages, since you want to flag things that are important, either from a technical standpoint (e.g. "fix the thing that's making the site not

work") or for the benefit of others who want to know which commits they should be paying attention to.

The phrase "Merge branch 'asdfasjkfdlas/alkdjf' into sdkjfls-final" mimics the phrasing used by Git. A branch is a specific sequence of commits which can be made in parallel to other branches of development, and later merged. Here, we see that Randall has also gotten lazy with his branch names: "branch 'asdfasjkfdlas/alkdjf'" might be the series of two commits starting with "here have code". "sdkjfls-final" could be the branch indicated by the vertical string of circles on the left, into which the other more branch is merged in commit "adkfjslkdfjsdklfj".

Most git tools show the commit history with the most recent commits first, so showing the oldest first like this would require something like the --reverse option.

Here's a detailed breakdown of the comments along with their respective timestamps:

1. ****Created Main Loop & Timing Control****
2. ****Enabled Config File Parsing****
3. ****Misc Bugfixes****
4. ****Code Additions/Edits****
5. ****More Code****
6. ****Adkfjslkdfjsdklfj****

7. ****My Hands Are Typing Words****

8. ****Haaaaaaaands****

1. ****Here Have Code****

2. ****Aaaaaaaa****

The log reflects a mix of serious development work, including the creation of core functionalities and bug fixes, alongside informal comments that suggest a relaxed or humorous atmosphere during the coding process. The presence of both structured and casual comments indicates a collaborative environment where developers feel comfortable expressing themselves.

#1297: Oort Cloud

November 29, 2013



... I wanna try. Hang on, be right back.

Explanation

The Oort cloud is a hypothesized sphere containing many small Solar System bodies, reaching out to roughly 50,000 AU (astronomical units) or nearly one light-year from the Sun. Gravitational forces from passing stars or collisions with other objects sometimes perturb one of these bodies enough to let it fall into the inner solar system. When it gets closer to the Sun, which is just a bright dot at that far distance, it warms up and some of its mass is lost as gas and dust, making it more visible as an object commonly referred to as a comet. In the comic, an object from said Oort cloud sees the Sun in the distance, decides to check it out, and comes to regret it for this reason.

There seems to be no definitive astronomical definition of the word "comet", and definitions can be challenging and problematic , but in general terms a comet is a celestial object consisting of a nucleus containing a huge amount of ices and dust which, when near the Sun, has an atmosphere (called coma) and perhaps a 'tail' of ionized gas and dust particles pointing away from the Sun.

The comet pictured here upon its return strangely resembles the unusual asteroid P/2013 P5. That object sported six comet-like tails, but it's not a comet. Rather, the six comet-like tails were suspected to be caused by rapid spinning of that object.

Randall has drawn the hapless Oort Cloud object with its tails generally left of frame, i.e. away from the Sun. Comet tails point away from the Sun regardless of their direction of movement, as they are blown out by the solar wind which moves much faster than the comet. As neither of the other two objects have tails, this lends the picture a comical cartoon-like quality, as when Yosemite Sam is blasted by his own gun and it leaves his mustache tails statically pointing away from the direction of the blast.

Comet ISON presumably came from the Oort cloud and reached its closest approach to the Sun (perihelion) on the day before this comic was published. The comet passed very close to the Sun, at a distance of 1,860,000 kilometers or 1,150,000 miles from the center of the sun. It was thus within one Sun-diameter of the surface of the Sun itself (diameter of Sun = 1,391,000 km). At that distance the temperature, at approx. 2,700 degrees Celsius, vaporizes rock as well as ice and can break the comet apart entirely.

The broken-up object here is presumed to be ISON, and is labeled as such in the transcript, even though Randall hasn't unambiguously identified it. Note that it's not realistic that ISON still would have a tail so far away from the Sun.

On December 2, 2013 NASA released a statement that ISON did not survive its close perihelion with the Sun. The Comet ISON Observing Campaign posted a delightful biographical sketch (In Memoriam Comet

C/2012 S1 (ISON) Born 4.5 Billion BC, Fragmented Nov 28, 2013, age 4.5-billion yrs old) which touches on its early years, retreat to the Oort Cloud, career as a Sungrazer, "dynamic and unpredictable life, alternating between periods of quiet reflection and violent outburst", delicate inner working, and its tragic demise.

The closest approach of ISON to the Earth was predicted for December 27, 2013 at a distance at approx. 60 million kilometers or 37 million miles, 170 hundred times more than the Moon. The Hubble Space Telescope looked for it on December 18 but saw nothing.

This video shows an animation of the encounter at the Sun: ISON 28.11.2013.

Perspective[edit]

Some more information about comets will help put the comic in perspective:

- The surface of cometary nuclei reflects less sunlight than asphalt. Telescopes can't identify or find them until they have a coma.
- An object at a distance of one light-year would only have an orbital speed about 100 meters per second; the speed of the Earth is about 30 kilometers per second.
- One revolution at that distance would last approximately 20 million years.

#1298: Exoplanet Neighborhood

December 02, 2013



It's a beautiful day in the neighborhood!

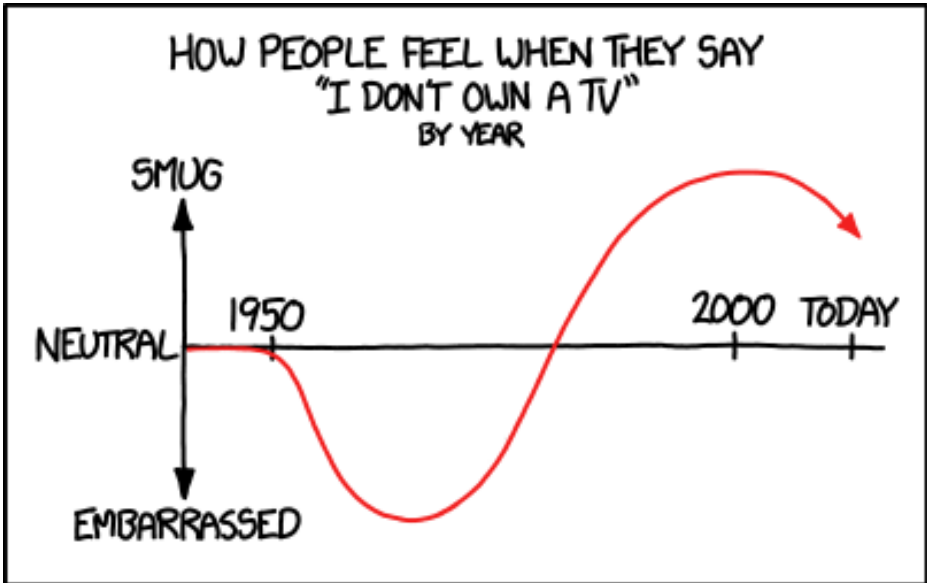
Explanation

Since almost all life on Earth (which is the only place we've actually found life thus far) depends on liquid water in some way, these planets are considered the most likely to support life. The diagram categorizes exoplanets in two ways. The disc color indicates the characteristics of the central star, with a reddish tone indicating hypothetical planets that orbit stars similar in characteristics to our sun, while grey indicates those that orbit stars unlike our sun. The disc sizes indicates the hypothetical size of the exoplanets, with planets similar to Earth's size depicted in a slightly darker shade of either color. Because the discs represent a distribution, their positioning within the diagram is irrelevant; the spacing around the title and the Earth is an artistic choice. It appears that the diagram is intended to cause the viewer to conclude that there are a significant number of Earth-sized planets orbiting Sun-type stars which could be habitable, and even more possibly-habitable planets around other types of stars or in other sizes.

The title text is an allusion to the former PBS television show *Mister Rogers' Neighborhood* in which the same line presents itself in the opening song, "Won't You Be My Neighbor?". Randall has commented on the results of exoplanet research before, in 786: Exoplanets and 1071: Exoplanets.

#1299: I Don't Own a TV

December 04, 2013



Theory: Smugness is proportional to the negative second derivative of TV ownership rate with respect to time.

Explanation

This comic is yet another graph, describing how people who don't own a television feel throughout several time periods. While televisions have existed since 1928, regular scheduled broadcasts of television programs did not begin until the late 1940s. So before the 1950s, it was common not to own a television and therefore most people's feelings about it would be fairly neutral. This changed as televisions became cheaper and more people started owning them, meaning that if someone didn't own a television, it was generally because they couldn't afford one. This might lead to someone feeling embarrassment when admitting they don't have a television.

Gradually, this attitude began to change. The graph puts the low point of embarrassment some time around the late 1960's or early 1970's. At this point, television ownership was becoming common enough that the medium was increasingly seen as primarily consisting of low-brow entertainment, with little to recommend it (FCC chair Newton N. Minow famously described television content as "a vast wasteland"). At the same time, televisions became increasingly inexpensive, until they were considered a standard feature in nearly every household. As a result, not owning a television increasingly became seen as a deliberate choice rather than evidence of poverty. Sometime around 1980, Randall sees perception shifting to where choosing to avoid television is seen as a decision that people are smug

about, rather than a source of embarrassment. The implication became that the only reason not to own a television is because you have better things to do than watch TV.

This point of view is seen as peaking around 2000, and then declining, to where people nowadays are more likely to be smug about lack of TV ownership than embarrassed, but less so than in the past. There are a number of possible reasons for this, but the biggest is probably the rise of multiple devices and streaming services, meaning that shows and movies can be consumed on tablets, phones, and computers, making televisions less ubiquitous. Not owning a television no longer indicates that you don't consume shows and films, but simply that you consume them in different ways. As a result, the trend is back toward neutrality: whether you own a television or not just isn't much of a statement anymore.

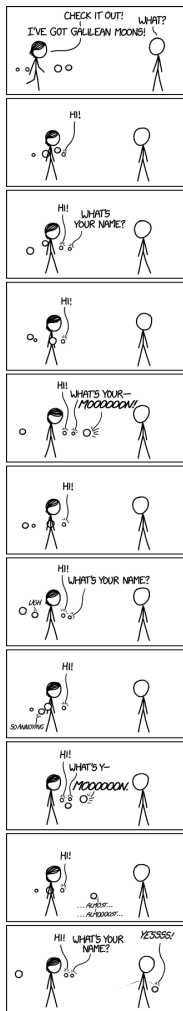
The title text suggests that whether people feel embarrassed or smug doesn't depend directly on what percentage of the population owns TVs (TV ownership rate) or even on how quickly this percentage is growing (derivative of TV ownership rate with respect to time); instead it depends on how the change in this percentage is speeding up or slowing down (second derivative of TV ownership rate with respect to time). Specifically, as the rate at which people adopt TV ownership accelerates (positive second derivative of TV ownership rate with respect to time), people who don't own one feel embarrassed (negative smugness); and as the market is

saturated and the rate at which people adopt TV ownership slows down (negative second derivative of TV ownership rate with respect to time), people who don't own one feel smug (positive smugness). If people feel twice as embarrassed/smug when this rate of acceleration/deceleration doubles, then we have Randall's formulation: "smugness is proportional to the negative second derivative of TV ownership rate with respect to time".

As evidence for this, the adoption of TV ownership should theoretically follow a sigmoid curve, which is the graph of something that starts small, grows in a spurt, and then approaches a maximum capacity (in this case 100%). The negative second derivative of a sigmoid curve looks very much like Randall's graph.

#1300: Galilean Moons

December 06, 2013



I'm SO glad I escaped. They almost had me caught in their weird ... thing.

Explanation

Megan has somehow acquired a set of Galilean moons similar to the four primary moons of Jupiter. The positions of the moons in the successive panels are reminiscent of the observations made by Galileo Galilei in 1610, which proved for the first time that objects in the heavens could orbit something other than the Earth (today these observations can be reproduced on successive nights by anyone looking at Jupiter with binoculars). As each of Megan's moons passes close to Cueball, it says something different:

- Io, the innermost and second smallest, says "Hi!".
- Europa, the second-innermost and smallest, says "What's your name?".
- Ganymede, the third moon from Jupiter and the largest in size, interrupts Europa by shouting "MOOOOOON!"
- Callisto, the farthest from Megan, expresses its annoyance at the antics of the other three moons.

Because the inner moons orbit Jupiter faster (due to Kepler's Third Law), they pass by Cueball more often: Io ten times, Europa five times, and Ganymede twice over the course of the comic. In fact, the outermost crater-scarred moon Callisto appears to have passed its closest approach to Cueball just before the first panel (perhaps before Megan and her retinue had walked up to Cueball) and does not approach Cueball again until the

tenth panel. At that point, due to some apparent exertion on Callisto's part, it leaves Megan's orbit and begins to orbit Cueball instead. This process could be seen as analogous to the capture of moons from one planet to another, which can happen in less stable systems than our solar system if two planets were to pass close to each other but is mostly just whimsical. The humor derives from attributing human characteristics to the moon Callisto in attempting to escape from the other three moons.

The title text refers to the unusual orbital resonance among the three inner Galilean moons: Io has an orbital period of about 1.78 Earth days, Europa 3.55 days, and Ganymede 7.15 days, putting them into a 1:2:4 resonance. Callisto, with an orbital period of 16.69 days, is not part of the resonant system. This is illustrated in the animated picture at right, where you may notice that all conjunctions between Io and Europa take place at the "12 o'clock" position and all conjunctions between Europa and Ganymede take place at "6 o'clock" position. You may also notice at the animated picture that, unlike in the fifth and ninth panels of the comic, the three moons are never on the same side of Jupiter at the same time. It is thought that this resonance came about as the moons migrated outward due to tidal acceleration; because the inner moons migrated more quickly, first Io caught up with the 2:1 resonance with Europa and then the two of them evolved outward in lockstep until Europa caught up with the 2:1 resonance with Ganymede. If the Jupiter system were to continue its

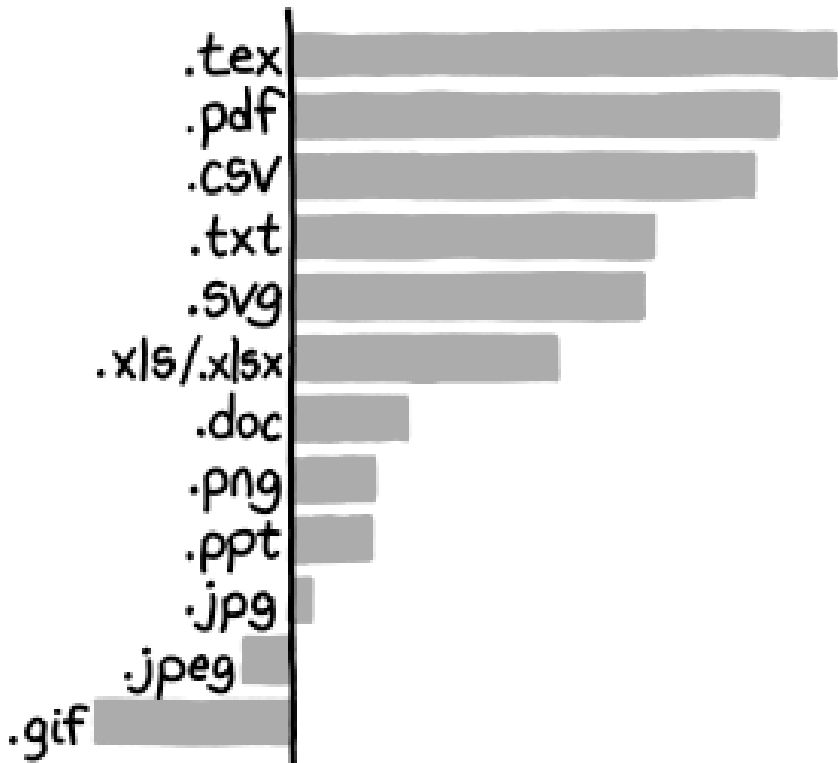
current evolutionary path for long enough (several billion years), Ganymede would eventually catch up to the 2:1 resonance with Callisto and Callisto would also be trapped in the resonance, becoming the fourth member of a 1:2:4:8 system. The title text expresses Callisto's relief at escaping such a fate, describing the relationship among the other three moons as "their weird ...thing." Callisto also escapes a common practice among certain groups of humans in which the members greet each other with meaningless phrases, usually an inside joke, whenever they meet, which could also be described as "their weird ...thing." The word "orbit" could finish Callisto's sentence, as it can also mean a sphere of influence or interest.

Later, in 2264: Satellite, Jill was orbited in a similar way by an abandoned satellite.

#1301: File Extensions

December 09, 2013

TRUSTWORTHINESS OF INFORMATION BY FILE EXTENSION



I have never been lied to by data in a .txt file which has been hand-aligned.

Explanation

Computer file names often end in file extensions like ".ppt" or ".exe". These extensions indicate to the operating system what type of data a file contains, and which program should be used to open it. Traditionally, file extensions were limited to three characters. Most modern operating systems and file systems now accept file extensions with arbitrary lengths, although most extensions remain three characters.

File extensions are an indication of file format. Many file formats were created to be used with a specific program, although software by other developers may later be extended to be able to read the format. For example, .doc is a Microsoft Word document. However, because of that software's popularity, many other word processors also include the ability to open .doc files. Other file formats are designed as standards, and may be opened by various programs; .jpg or .gif images for example.

Certain file formats or types are very commonly used, like .doc, .jpg, and .zip. Others are more prevalent for very specific usecases. Here, Randall presents a list of file extensions, and rates the reliability of the information within from most to least reliable.

- .tex files are source files for the programs TeX and LaTeX, which are used often and almost exclusively by academics, especially in mathematics and the hard sciences. .tex pretty much means serious business, and

Randall does not anticipate that anyone would use such a format other than for reliable information.

- .pdf files are a portable (as in over the web) document format by Adobe, frequently used for publication. Companies use them for official documentation. Thus, a .pdf file is likely to be some type of final product or polished work. Further, .tex files are generally compiled into .pdf files in order to make them readable. It would be strange to trust a .tex file without trusting the .pdf to which it compiles. For example, when submitting to academic journals in math and the hard sciences, the journal accepts the .tex file, but then compiles it and publishes the resulting .pdf. On the other hand, software which can produce a .doc/.xls(x), as described below, these days tends to have an inbuilt or addable ability to "Export to PDF", with the promise of slightly more read-onlyness and localisation-immunity than the .doc, so it might arise - in good faith or otherwise - from a less professional editor trying to look a little more serious about the copy they distribute in this document format. The reliability of .pdf files would later be referenced in 2304: Preprint.
- .csv are comma-separated values: tables of information delimited by commas, and often consist of computer-generated raw data (from, say, a scientific experiment or a database).
- .txt files contain only plain text, no "rich text" or anything fancy. Programmers often use them for README files. The txt format indicates that the creator prioritizes recording the information over

making the information visually appealing, although ASCII art images or multiline 'bannering' of text might be included by some authors.

- .svg files are a (scalable) vector graphics format used a lot for diagrams, such as on Wikipedia.
- .xls and .xlsx files are spreadsheets used and created by the program Microsoft Excel, part of a bundle of applications known as Microsoft Office (also supported by compatible free software such as LibreOffice). These applications are very commonly used, especially for business, finance and data analysis tasks. .xls is a binary format used for Excel versions up to 2003, while .xlsx is a ZIPped XML-based format used for Excel versions 2007 and later.
- .doc files are a rich-text document format used and created by the program Microsoft Word, another application in the Microsoft Office bundle. As with .xls, almost anyone with access to Microsoft Office could easily make one of these. While Excel is generally used for creating tables and presenting data, Word could be used for any text-based document. Thus, Word documents tend to be far more prevalent and casually created than Excel documents, which is presumably why Randall doesn't trust them as much.
- .png files are a bitmap image format designed for the Internet. They enjoy wide popularity for providing crisp, full-color images with lossless (reversible) compression. Almost all xkcd comics, this diagram included, use PNG. But, since anyone can create an image (you can draw something online and it will use

.png), Randall rates this type as not very trustworthy.

- .ppt files are used and created by the program Microsoft PowerPoint; as with the other two Office applications, almost anyone could easily make one of these. As they are usually used for presentations rather than documents, the information in them may be arranged differently, possibly to "dumb down" the content, or in marketing materials or talks in which the author may not be very objective. Further, several years ago, PowerPoint presentations were sometimes included instead of plain images as attachments in e-mail forwards containing inaccurate information. These emails still occasionally circulate, and may be the source of Randall's distrust.
- .jpg files are another image format with high compression capabilities, good for storing photos and not so good for many other things. Photographs in general are prone to image manipulation, hence Randall's low score for this file format.
- .jpeg files are the same thing as .jpg files, but these are more likely to have been created manually rather than automatically, making them even less reliable.
- .gif files are yet another bitmap image format, notable for supporting short animations. GIF was once the Internet image file format until PNG gradually replaced it. Since GIF is the only common image format capable of animation, it is often used to contain things like silly clips of cats falling into boxes, or annoying, blinking advertisements claiming that "you're the 100,000,000th VISITOR!". GIFs are also created by

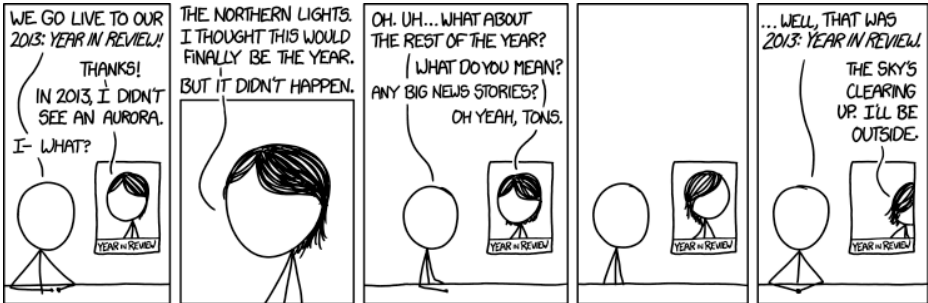
Internet trolls, such as on 4chan.org, to feed misinformation to gullible gamers and other computer users. For example, a recent Xbox One Hoax GIF contained instructions that were said to make the Xbox One backwards compatible with Xbox 360 games, but would actually make the console inoperable.

Note that while the extensions .xls/.xlsx, .doc, and .ppt were originally exclusive only to Microsoft Office and users of Windows, there now exist a number of open source programs such as Open Office, Libre Office, and some Android apps that are capable of editing such files. These programs can run on systems other than just Windows, such as Linux, perhaps contributing to making them even more widespread and easy to make than before.

The title text refers to how .txt files contain only plain text and nothing else, meaning that any alignment (such as for indentation, tables, or justification) would have to be performed manually by adding in spaces or tabs. Anyone who would go through such an effort to improve their text's readability is likely to be trustworthy, and almost by definition, the opinion presented would be justified.

#1302: Year in Review

December 11, 2013



All in all, I give this year a C-. There were no aurora visible from my house and that comet evaporated. They'd better not cancel the 2017 eclipse.

Explanation

Many news organizations will recap the major stories of the past calendar year in late December (typically before the year has actually ended). This includes specialized news outlets such as sports stations which recap major sports stories or best plays of the year. Here, Cueball, as a news anchor, expects Megan to talk about major news stories of 2013 such as the roll-out of Obamacare, the election of Pope Francis or the death of Nelson Mandela, to give a few examples.

Instead, Megan only recaps one thing which was important to her: She did not see the aurora borealis (i.e. northern lights) in 2013, the dazzling natural geomagnetic light display caused by the solar wind. In 2013 a solar maximum was expected at its solar cycle, but the activity of the sun wasn't as heavy as before. So, a northern light had been very rare in this year. Megan has never seen the northern lights, and she is frustrated that it did not happen for her in 2013, thus overshadowing all other events. She even leaves in the middle of the review when she notices the sky clearing up, as she wishes to check if there are any northern light this evening. This may very well be Randall's own frustration which is displayed here.

It turns out in the title text that Megan is actually reviewing the astronomical year, only considering astronomical events. She even rates it much like a movie review, although she seems to use the A-F grade scale. She

only gives the year a C- (C minus), which would usually be the lowest passable grade, so she just lets the year pass in spite of the two failing events mentioned in the title text.

In the title text, Megan specifically complains about not being able to see aurorae from her house. If Megan actually represents Randall's frustration, then to expect to see it from a house in Massachusetts would be a lot to ask for. Usually, people who wish to see Northern lights will travel to an arctic area and stay away from light pollution from cities. But in years with heavy solar activity, northern light may be visible even south of Massachusetts.

The title text also refers to Comet ISON. In February, a rough estimate of the comet's behavior predicted that it would become brighter than the full moon, a prediction that was widely reported by the media even though it was based on limited data and astronomers knew that it would not reach this brightness. In the end, although it was visible to the naked eye, it was never as bright as anybody hoped and apparently disintegrated on November 28, 2013, at its close approach to the sun.

The title text also refers to the 2017 total eclipse, which was visible as a partial eclipse for a few hours throughout North America on August 21 Monday, including a 100-mile wide band across the United States where it was a total eclipse for a couple of minutes in the early afternoon. Eclipses are completely predictable - although the weather might be cloudy so that the sun is blocked

during totality, they will happen anyway. So Megan is being extremely pessimistic to even suggest that the 2017 eclipse might get canceled. Humorously, her statement that someone might decide to cancel the eclipse makes it sound like a concert that could be canceled by the organizer. It seems that Megan thinks that the "they" who could cancel the eclipse are the same "they" that caused the comet to disintegrate and the solar activity to stay low. Anyone with the kind of power to stop a solar eclipse from happening would be god-like compared to humanity. The next time that the eclipse was mentioned was in the New Year comic for 2017: 1779: 2017. The subject of the title text of that comic is the likelihood that the eclipse will indeed happen as planned.

All in all, the comic suggests that the only events of significance to Megan (and Randall) are astronomical ones; the actions of humanity pale in comparison.

The joke of Megan answering a question in an interview in an unexpected manner has been used before in 1111: Premiere.

Interestingly in 1037: Umwelt there is an aurora story line where Megan stays inside at her computer even though it can be seen from her own state, letting her friend go out alone. (So not the same Megan for sure).

#1303: Profile Info

December 13, 2013

FIRST NAME:
JOHN

LAST NAME:
IF-YOU-SEE-THIS-NAME-IN-
AN-AD-GIVE-THE-PRODUCT-
A-ONE-STAR-REVIEW-SMITH

A simple line drawing of a person sitting at a desk with a computer monitor. The person is represented by a circle for a head and a simple outline for a body, sitting on a swivel chair. The desk is a rectangular table with a computer monitor on it. The person's hands are on the desk, near the monitor.

HOW TO DEAL WITH
COMPANIES HARVESTING YOUR
PROFILE FOR MARKETING

It's ok, they'll always let you opt out! Like they did with the YouTube real name profile thing.

Explanation

On most websites people are forced to create an account to get proper support, be it technical support or simply ordering products. This usually consists of the user's name, email address, phone number, and also the user's home address if ordering a product that must be shipped by mail. It's not uncommon for the websites/companies to then use that information for presenting new advertisements in the near future, or even sell it to others for their schemes.

In 2013 (publishing of this comic), a recent trend was to allow harvesting of profile pictures and real names, mostly by automated processes with little to no human interaction. The personal information is collected in context with other information, such as the purchase or product review history, and shown to people (typically friends and contacts) who are viewing similar products.

The title text references the fact that most of these companies have an "opt out" option so that your name won't be used, but then emphasizes that YouTube (a subsidiary of Google) at the time of this comic forced YouTube user accounts to be tied to Google+. Google+ required the use of the 'first name' and 'last name' convention typical of western cultures, where one cannot 'opt out' (though these requirements did allow for the abbreviation of names). However, this has not stopped people from using names that aren't their own, but using names like "Barack Obama" and "Chuck Norris". Some

similar websites allowed the use of aliases in their initial terms of use, but then later changed their TOCs to prohibit use of "false" names. YouTube was one such system; after the merge with Google+ for authentication, both sites automatically linked your false-name account with your real name account, in some cases banning and blocking people with suspected false name accounts.

To try to put a stop to his own information being used, Cueball sets his last name to "If-you-see-this-name-in-an-ad-give-the-product-a-one-star-review-Smith", a name which includes a phrase that would negatively affect any marketer's attempts to advertise an online product.[citation needed] This name would pass though most harvesting software as-is, and may very well end up being used in such ads, unless some very clever software is able to detect sentences as part of names or similar. In fact much spam is stopped by identifying emails through Honeypot accounts, among other methods.

Hence engineering part of your profile could be a winning strategy to signal to your friends that your information is harvested without your express knowledge.

#1304: Glass Trolling

December 16, 2013

MY HOBBY:



SAYING "OK, GLASS" BEFORE
EVERYTHING WHILE WEARING
REGULAR GLASSES.

Plus, when someone finally grabs your glasses and stomps on them, it costs way less than \$1,500 to replace them.

Explanation

This is another comic in the My Hobby series. Google Glass was a set of glasses frames worn like typical glasses that features an optical display and internet connectivity. It responded to voice commands starting with "OK glass", for example to initiate video recording or to check tomorrow's weather. Strangers and other people surrounding the user would often find it annoying to hear someone talking to "himself", or to Glass. Also many people who bought the newest gadgets, like Google Glass was, like to brag about it, and thus would try to say OK Glass so loud that other people will notice they have these cool new glasses. This was very annoying in general!

Randall's hobby is saying "OK, glass" before any sentence while he is only wearing regular glasses. Like here where he (drawn as usual like Cueball, with regular glasses) is checking tomorrow's weather, not on the glasses but on his smartphone. Apparently this is even more annoying to the bystander than if he would actually have worn a real Google Glass while saying so. He thus both annoys other people, mocks people who buy such glasses to brag about them, and in general mocks Google Glass.

The "OK, Glass" keyword is not useless outside of Glass; in the browser Chrome and the Android/iOS app Google Now, "OK, Glass" is also valid instead of "OK, Google" to initiate a voice command. While Cueball may be using this app, it is not necessarily the case, given that the caption states that Cueball enjoys prefacing

everything with the phrase. It seems generally that Randall was no fan of Google Glass, which was also shown earlier in 1251: Anti-Glass. Google Glass was a recurring theme in xkcd in 2013.

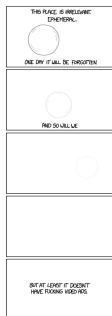
In the title text, Randall states that there is an extra benefit by doing this while only wearing regular glasses. Because when someone is finally fed up with the annoyance and rips the glasses off and stomps on them, then it would cost much less for regular glasses than if he had to replace a "Google Glass". These were very expensive - \$1,500 at the time of this comic, as the title text says. (Note that regular glasses can also be very expensive, but you could choose to wear your reserve glasses for such a prank...). Also several people have claimed to been attacked while wearing Google Glass in San Francisco, with one person claiming their attacker destroyed their Glass.

#1305: Undocumented Feature

December 18, 2013



MECON



And it doesn't pop up a box every time asking you to use your real name. In fact, there's no way to set your name at all. You just have to keep reminding people who you are.

Explanation

An undocumented feature is a part of a software product that is not explained in the documentation for the product. Cueball has found such a feature, a chat room intended to ask for help, accessible through the help page of some unnamed old Windows utility. The people who found the chat room started out using it for its intended purpose (helping users of the utility by contacting other users), however as time has passed they have become friends and enter the chat only to talk to each other, with no relation to computer problems.

A virtual machine (or VM) is a computer program designed to emulate the hardware of a full computer. In this case, users of the old chat room create VMs only to have the old operating system installed which included the utility program. They use this setup only to access the old chat room. This is shown in the third panel where Cueball is using a modern laptop to enter the chatroom (presumably by means of a VM), whereas Ponytail is most likely using an old computer (as evidenced by the CRT monitor).

A chat room like this must be hosted on some outside server, so the narrator of the comic wonders who runs this server. An obvious thought about this is if and when the server will be shut down, effectively cutting all communication among chat users. Another obvious thought is why the utility author is still maintaining the chat server, since its original purpose of allowing

communication between users with problems with the utility program is no longer an issue as everybody has migrated to more modern systems. The comic suggests that the reason for doing this can be a bored sysadmin, who is just reading the messages of the chat users and following their lives but never writing anything. This would turn the chat room into a soap opera for the sysadmin.

The Deep Web is a term used to refer to any information which is available online, but is hard to find (usually because there are no links to that information in web pages). The chat room described would be an example of this. From this point on, the comic takes an existentialist turn (a frequent xkcd trait), talking about how life is short, everything has to end, etc.

The last panel is a reference to Facebook's recent announcement that it would start autoplaying video ads, and the title text refers to YouTube requiring its users to use their real-life identities instead of just nicknames. These last parts of the comics somehow reveal that the point of the whole comic is just to complain about aggressive money-driven policies used by modern social networks in general and Facebook in particular. It is hinted that Randall would prefer older technologies, where limited resources would forbid autoplaying videos or huge databases with every detail of every user's life.

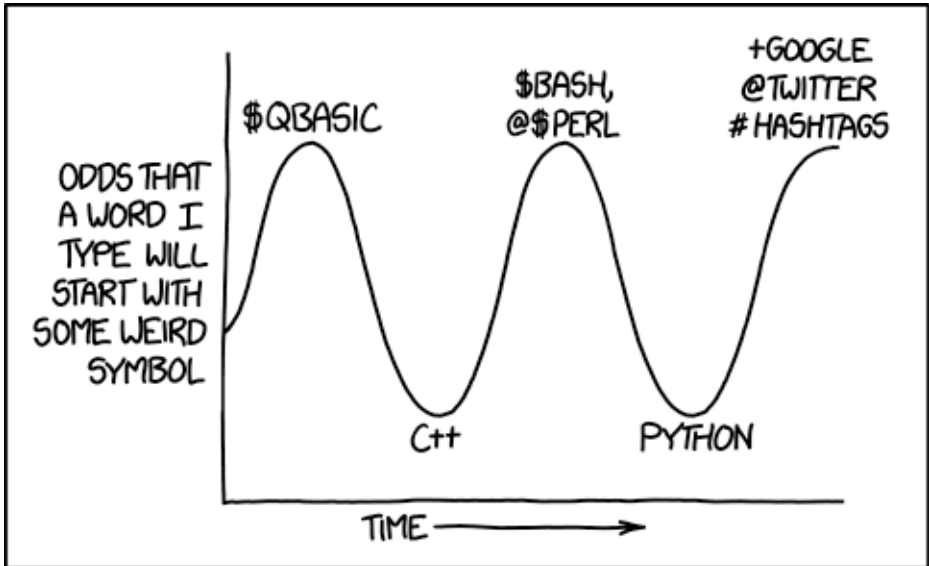
It's possible that the comic is about an actual chat (like euphoria.leet.nu/room/xkcd), but more likely it is a complete invention, since if it were real someone would

have been able to trace its origin. However, if it is real, the participants would not want to confirm this in order to protect their privacy.

The title text mentions the simplicity of this chat; even user names do not exist and other users could only be identified by their behavior. The suggestion of using a real name references the Google+ controversy caused by only allowing real names.

#1306: Sigil Cycle

December 20, 2013



The cycle seems to be 'we need these symbols to clarify what types of things we're referring to!' followed by 'wait, it turns out words already do that.'

Explanation

In computer programming, a variable is a way of storing information temporarily, for use later in the program. There are different types of variables, called data types, such as integers, strings, characters, and booleans, all of them holding different types of information. Integers hold whole numbers, strings hold text, and so on. Variables traditionally have names that identify their purpose, and a programmer should usually be able to infer from this variable name what type of variable it is. For example, if you want to store the name of the customer in a catalogue service, you might store the text in a string variable called "NameOfCustomer". Because it is fairly clear that names are made up of text, it is logical that this variable would be a string variable - if you didn't have any other information about it.

A sigil in computer programming is a symbol that appears before the variable name. It is an alternative method of telling someone who is reading the program code what data type the variable is. Rather than relying on logic, then, to know that NameOfCustomer is a string, you might use a sigil "\$" before the variable name, as in \$NameOfCustomer, which would specify that the variable can hold text. Sigils can also specify the scope of a variable, which refers to where the variable can be used in a program, and which parts of the program can access that variable. Sigils are useful in some ways because you don't have to refer to previous program code or find where the variable is declared (created) to know what

data type it is. They also provide some level typing in languages that do not explicitly declare the type of the variable.

Most programming languages have a different method for storing variables, although some languages may use the same variable types under different names. The following are the programming languages referenced in the comic and how they use variables.

As is noted by the comic, the use of sigils to indicate types of variables varies between programming languages, from strict enforcement in languages like Perl, to their complete absence in languages like C++ (but see Hungarian Notation). The comic notes that the use of sigils seems to be cyclic, especially if you count things like hashtags as extensions of the pattern.

The title text describes the two competing influences responsible for the cycle: The first impulse finds sigils useful to elucidate the type of the variable, especially when variable names are not very descriptive, while the latter impulse notes that descriptive variable names are much more useful for that purpose, especially in extensible languages where the built-in types form only a small part of the type system.

#1307: BuzzFeed Christmas

December 23, 2013



CAROLERS OUTSIDE THE BUZZFEED
OFFICES PERFORM "12 WEIRD THINGS
I ACTUALLY GOT FOR CHRISTMAS"

The 6 Weirdest Objects The BuzzFeed Writers Are
Throwing Out Their Windows At Us

Explanation

Christmas caroling is a tradition in which groups of singers travel from house to house, singing carols.

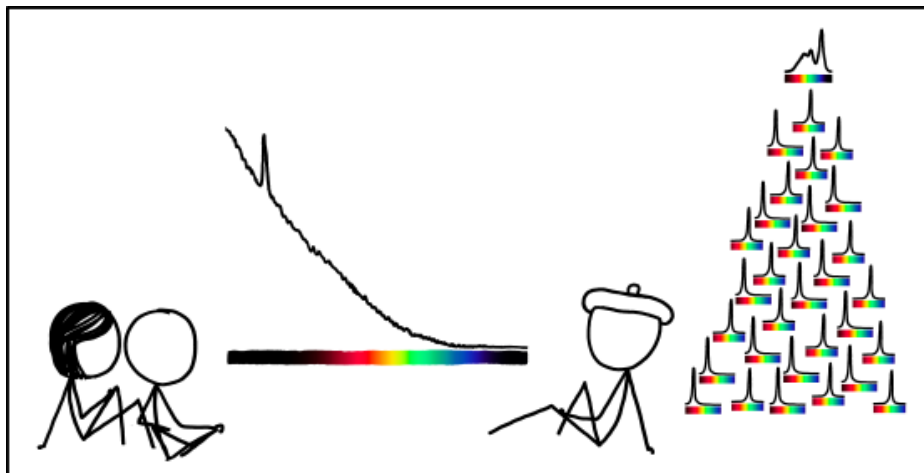
These carolers are in front of the BuzzFeed offices singing the The Twelve Days of Christmas, which usually contains:

The carolers changed the lyrics to match the style of headlines of the topics published by BuzzFeed, which usually contain a number and a superlative; for example, 13 Worst Plane Crashes of the Decade or 8 Otters Who Are So Cute We Can't Even Handle It. This method of writing headlines, referred to as clickbait, is used by several other news sites, because it is known to generate a lot of visits and therefore more ad revenue. Randall has touched on this subject before, in 1283: Headlines.

Carolers are usually rewarded with a gift, but the BuzzFeed writers probably didn't appreciate the song, because they threw "weird stuff" (probably office supplies) at them.

#1308: Christmas Lights

December 25, 2013



Merry Christmas from xkcd!

Explanation

Each light in this Christmas scene is represented by its electromagnetic spectrum, which shows in a graphical form how much energy is radiated by each wavelength of light.

These graphs plot the intensity of all visible radiation. Infrared and ultraviolet are partially plotted also, represented by black. It starts with longer wavelengths on the left (infrared), continues with visible light in the middle from red to blue, and ends with ultraviolet at the right. There are 4 distinct spectra in this comic:

In the center of the image, between Beret Guy and the couple, Cueball and Megan, appears to be a light spectrum of a fire, notable because it emits a lot of energy in the infrared band (The left zone of the spectrum), emitted typically from hot sources, and in the red and orange zone. The spike toward the left hand side of the spectrum is likely the $4.3\text{ }\mu\text{m}$ resonance wavelength of hot CO_2 characteristic of burning hydrocarbons; see Emission of radiation. Given the size of the spectrum and its positioning, this represents a fireplace at which the characters are warming themselves against the winter chill.

In the right of the comic appear some spectra arranged in the form of a Christmas tree. There are 3 different spectra in this "Christmas tree":

At the top appears a complicated spectrum, possibly that of a white LED, representing the tradition in some cultures of putting a star (or an angel, but still usually lit) at the top of the Christmas tree.

In the branches there are two simpler spectra repeated at various places, one with a peak in the green zone, representing a green light source, and other with a peak in the red zone, representing a red light source. Both of these represent the tradition of putting colorful decoration in the tree, in this case apparently red and green colored Christmas lights.

In 835: Tree a similarly strange Christmas tree has been constructed using binary trees, albeit against Cueball's parents' wishes.

#1309: Infinite Scrolling

December 27, 2013



IF BOOKS WORKED LIKE INFINITE-SCROLLING WEBPAGES

Maybe we should give up on the whole idea of a 'back' button. 'Show me that thing I was looking at a moment ago' might just be too complicated an idea for the modern web.

Explanation

Infinite scrolling is a technique in web design where a large data set is displayed as a seemingly infinite list, but in reality only the visible part of the list (and the surrounding data) is rendered. This is done to work around memory limitations of old browsers and mobile devices or to save on data transfer size.

The problem with this technique is that if you navigate from this page to a different page and go back, the location of the scrolled data set is often lost and the top of the data set is displayed again. Also it is usually not possible to point a URL directly to a certain section of the infinite list, a practice known as deep linking. For these reasons, many prefer pagination, the method traditionally used in books, over infinite scrolling.

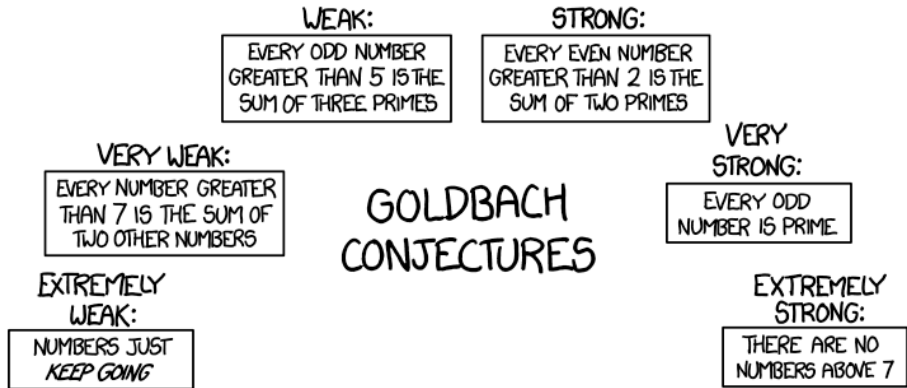
In this comic Megan is handling the book gingerly as if it were a device with a touchscreen where the book is displayed as an infinite scrolling text. Touching a link would navigate away from the list and the current reading position would be lost.

In the title text it is an ironic suggestion that the "back" button is now useless. The back-button is supposed to give you this functionality but due to the failure to implement continuous scrolling sites and deep-linking correctly they are typically useless when the user is reading infinite-scrolling data (or worse, flat-out counterproductive, giving you the wrong page).

Alternatively, this might be a joke on the stereotype that web users are unable to make the most helpful or intelligent decisions, similarly to 1454: Done, 1974: Conversational Dynamics, and 2051: Bad Opinions.

#1310: Goldbach Conjectures

December 30, 2013



The weak twin primes conjecture states that there are infinitely many pairs of primes. The strong twin primes conjecture states that every prime p has a twin prime $(p+2)$, although $(p+2)$ may not look prime at first. The tautological prime conjecture states that the tautological prime conjecture is true.

Explanation

In mathematics, a pair of related conjectures may be described as "strong" and "weak" (or often, a normal statement and a "weak" one). A strong conjecture, if true, can be used to easily prove the weaker one, but not vice versa (i.e. if the weak statement is true, that alone isn't enough to prove that the strong one is also true). Conversely, if the weak conjecture is false, that is enough to prove the stronger one false as well, but not vice versa. Weak conjectures are often easier to prove than related strong ones.

Goldbach's weak and strong conjectures are a pair of real, unsolved problems relating to prime numbers (a number with exactly two positive divisors, 1 and itself). The comic states these under the labels "weak" and "strong".

- Goldbach's weak conjecture says that every odd number above 5 can be written as the sum of three prime numbers. A computer-aided proof of this was completed in 2013, but the proof is still being checked.
- Goldbach's strong conjecture (more often, simply "Goldbach's conjecture") says that every even number above 2 can be written as the sum of two prime numbers. If true, this would automatically make the weak conjecture true as well, because every odd number above 5 can be written as an even number above 2 (equal to two primes), plus 3 (the third prime).

Randall's further conjectures extend this to a whole series

of progressively "weaker" and "stronger" statements. His weak conjectures are so weak that they are obviously true; his strong conjectures are so restrictive that they are obviously false. However, for the most part, they really do maintain a weak-strong relationship.

- The "very strong" conjecture says that every odd number is prime. This is false, because some odd numbers are composite (e.g. 9, 15, 21), and composite numbers are not prime.[citation needed] But if this conjecture were true, it would make Goldbach's (strong) conjecture true as well, because every even number can be written as the sum of two odd numbers (which, by this "conjecture", are prime).
- The "extremely strong" conjecture says that numbers stop at 7. This is false, but if it were true, it might make the above conjecture true as well: 9 is the first odd composite number, so stopping at 7 would eliminate all odd composite numbers. (1 is neither prime nor composite, but it has been counted as a prime number in the past. Randall may have meant 1 to be an unspoken exception, or he may be returning to the older definition that included 1 as prime.)
- In the other direction, the "very weak" conjecture says that every number above 7 can be written as the sum of two other numbers. This is true,[citation needed] but as it says nothing about primes, it isn't enough to prove Goldbach's weak conjecture. The weak conjecture being true would automatically make this one true, though (if we didn't already know it was true).

- The "extremely weak" conjecture says that "numbers just keep going". This is true, but it may not actually be implied by the above conjectures. Those say that numbers above 7 have certain properties, without requiring that such numbers exist. This may seem like a nitpicky point, but mathematicians love those; it also causes problems, because the "extremely strong" and "extremely weak" conjectures contradict each other. If the other conjectures were rewritten to say "these numbers exist, and have these properties", then they would imply this "extremely weak" conjecture, but then the "extremely strong" one would have to be stricken off.

The title text gives the same treatment to the twin prime conjecture, which says that there are infinitely many pairs of primes where one is 2 more than the other (e.g. 3 and 5). The title text adds a "weak" conjecture, according to which there are simply infinitely many pairs of primes (with no mention of the distance between them). This is true; Euclid's theorem says that there are an infinite number of primes, and so you can simply pick any two (e.g. 5 and 13) and call them a pair.

It also adds a "strong" conjecture where every prime is now a twin prime. This is easily proven false; 23 is prime, for example, but cannot be one of a pair as neither 21 nor 25 are. However, Randall adds a humorous hedge that some prime numbers "may not look prime at first".

Lastly, the tautological prime conjecture states that it itself is true while making no statement about primes. It

is not technically a tautology but more of a plain assertion. Randall has mentioned tautologies before in 703: Honor Societies.

History of Goldbach's conjecture[edit]

Mathematician Christian Goldbach wrote a form of his conjecture (the "strong" one of the comic) in a letter to the famous Leonhard Euler in 1742. Euler replied that he considered it certainly true, but that he could not prove it.

Mathematicians have been solving related problems that are "weaker" than Goldbach's weak conjecture and working towards "stronger" ones. For example, in 1937 the weak conjecture was proven for odd numbers greater than 314348907. In 1995 a version was proven based on the sum of no more than seven prime numbers, and in 2012 the ceiling was lowered to five primes. In 2013 the weak conjecture was claimed proven for numbers greater than 1030 (as of 2024, checking of this proof is ongoing), while all numbers below 1030 have been verified by supercomputers to satisfy the conjecture; these together imply that the weak conjecture is true, although there is no general proof of it for all numbers. Goldbach's strong conjecture remains unsolved.

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